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ABSTRACT

Volume II of the Project World of Work Packets contains lesson plans for the Industriology, or second, level of the program. It includes units on Papermaking (Grades 7 and 8), and Leathercraft (no grade level specified), by McPherson, Harkins, and Rivest; Oceanography (no grade level specified), by Miller and Beisel; and Home Economics (Grades 7 and 8), by Loretta Grace. Project World of Work is a K-12 continuum in which various aspects of career awareness and preparation are presented to the student. (AG)

ED 086786

FINAL REPORT

Project No. 0-361-0052

Grant No. OEG-0-70-5191 (361)

WORLD OF WORK

Exemplary Project in Vocational Education

Conducted Under

Part D of Public Law 90-576

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VOLUME II

LEARNING PACKETS

Charles Pieterse

Contoocook Valley Regional School District

Route 202 North

Peterborough, New Hampshire 03458

June 1973

CE 000 725

INTRODUCTION
TO
HOME ECONOMICS

INDUSTRIOLOGY PROGRAM

Contoocook Valley School District
Supervisory Union 47
Peterborough, New Hampshire

May 1973

7th & 8th Grades

Prepared by: Loretta Grace

Program Consultant: John L. Davy

Funded by: Project world of Work
PL 90-576

GENERAL GOALS

INDUSTRIOLOGY PROGRAM

1. To develop in each student an awareness and understanding of the development of industry and its social and moral obligations on society.

2. To develop an awareness within each student of one's role as a wage earner in today's society.

3. To expand each student's self-confidence by having each student work in areas requiring responsibilities.

4. To improve a student's leadership ability through role playing.

5. To develop within the student an awareness and the ability to distinguish quality of products.

6. To create a situation where students work necessitates the need for joint cooperation and communication.

7. To develop business experience and business contacts by controlling and operating their own company.

8. To develop student awareness of job opportunities within the defined unit of study.

INDUSTRIOLOGY - HOME ECONOMICS

Lesson #1

GOAL:

1. To provide motivation prior to the establishment of a student operated company.

2. To develop an awareness of the activities involved in assembly line preparation of single food product.

PERFORMANCE OBJECTIVES:

1. All students will be able to apply their knowledge of
   a. Assembly line procedures
   b. Food storage techniques
   c. Sanitation procedures
   d. Planning portioned amounts for large quantity of a given product.
   e. Quality control
   f. Safety

   to the extent that they use this knowledge in the operation of their own company.

OUTLINE:

1. Field trip

STUDENT ACTIVITIES:

1. Field trip to Servomation of New England, Inc., Middlesex Industrial Park, Stoneham, Massachusetts 02180. Directions: Rte. 3 to 495 to 193. All day trip, leave school at 8:30 A.M.

TEACHER PREPARATION:

1. Contact Servomation
   - video tape?
   - book dates
2. Contact bus company
   - book dates
   - Does bus need to be back for close of school?
3. Letter to parents
   - lunch
   - dress
   - adults as chaperons
   - late bus and/or transportation home
   - permission slips, including phone number.

RESOURCES:

SUPPLY NEEDS:

SAMPLE COPY OF A PERMISSION SLIP

January 22, 1973

Dear Parents:

The A Team 8th Grade Home Economics Classes are going on a field trip to Servomation, Stoneham, Massachusetts, on Monday, February 12, 1973. Transportation will be by bus leaving Peterborough Middle School at 8:30 a.m. and arriving back at the school about 4:00 p.m. Students are asked to arrange transportation home at that time. (There is a late bus going to the center of each town in the district) and to bring a bag lunch with enough money to buy drinks. Also, the girls are asked to pay particular attention to dress. Please dress-up more than for a regular school day. Chaperones on the bus will be Mrs. S.D. Grace, Home Economics Teacher, Mr. John L. Davy, Project world of work, and three parents. If you have any question please call me at 924-7106.

Sincerely yours,

Mrs. Stephen D. Grace
Home Economics Teacher

_____ has my permission to go with
(Name)
her Home Economics Class on the field trip to Servomation, Stoneham, Massachusetts on Monday, February 12, 1973.

Signed: _____
(Parent or Guardian)

INDUSTRIOLOGY - HOME ECONOMICS

Lesson # 2

GOAL:
1. To develop an awareness of the activities involved in assembly line preparation of a single food product.

PERFORMANCE OBJECTIVES:
1. All students will be able to discuss a list of teacher prepared questions about the field trip and write a thank you note including highlights of what they learned.

OUTLINE:

Field trip follow up.

STUDENT ACTIVITIES:
1. Discussion of Informational Guide lines for field trips on occupations.

2. Write thank you note to:
   Mr. Vincent Lee
   Food Manager, Servomation of New England, Inc.
   Middlesex Industrial Park
   Stoneham, Massachusetts 02180

TEACHER PREPARATION:
1. Discussion questions

NOTE: Teacher should write a brief thanks to parents who went as chaperones on trip.

RESOURCES:

SUPPLY NEEDS:
1. Appropriate paper for thank you notes.

INFORMATIONAL GUIDE FOR FIELD TRIPS ON OCCUPATIONS

1. Does the product of this work meet a need or a want?
2. Could we do without the services of the worker in this field?
3. About how many workers in the State of New Hampshire are engaged in this occupation?
4. What does the worker do in the course of the day?
5. Do his duties change from day to day, or do they change at different seasons of the year?
6. What are the hours of work and the opportunities for vacation and recreation?
7. Is emplyment secure and steady, or are there many layoffs?
8. Are the working conditions and surroundings pleasant?
9. Are there any dangers to health and safety?
10. Does the worker do the same thing all day, or is there a variety of things to do?
11. Does the worker work alone or with other people?
12. How much general education is needed-elementary school, junior high school, senior high school, or college?
13. Is apprenticeship or trade school training necessary?
14. Is a long period of professional preparation necessary?
15. What schools, if any, offer the special training necessary?
16. How much time must be spent on the job in order to learn it well?
17. Are there any special aptitudes or personal qualities necessary--for example, aptitude in drawing or music, the quality of patience, a liking for people?
18. Are there any particular physical requirements, such as good eyesight, a certain height or weight, or great endurance?
19. To what better positions does the occupation lead?
20. Is the occupation overcrowded?
21. Is the number of workers in the occupation gr[illegible] decreasing?
22. Are there organizations, such as unions or associations, to which the worker can belong?
23. What are the purposes of the organizations and the requirements for membership in them?
24. Are there any government regulations unique to this occupation?

INDUSTRIOLOGY - HOME ECONOMICS

Lesson # 3

GOAL:

1. To develop an awareness and understanding of the development, types, and structure of industry.

PERFORMANCE OBJECTIVES:

1. Given charts - "This is the Industrial Revolution" and "Tools that Created Civilization" - each student will develop a poster depiciting or tracing the historical development of industry.

2. Given a slide film series to be shown - "Activities of Industry" and study guide each student will be able to discuss the common structure of business corporations which are product development purchasing, manufacturing activity, industrial relations, internal finance and office service, and marketing.

3. Given a study guide on the types of industry each student will list two advantages and two disadvantages for each of the three types industries.

OUTLINE:

I. Industry defined
   - A. Goal of industry - to make a profit
   - B. History - including industrial revolution
   - C. Types
     1. Sole Proprietership
        - a. Advantages
          - (1.) Ownership of all profit
          - (2.) Ease of organization
          - (3.) Freedom and promptness of action
          - (4.) Tax savings
          - (5.) Personal incentive and satisfaction
          - (6.) Minimum legal restrictions on form
          - (7.) High credit standing
          - (8.) Secrecy
          - (9.) Ease of dissolution
        - b. Disadvantages
          - (1.) Unlimited liability
          - (2.) Difficulties of management
          - (3.) Limitation of size
          - (4.) Lack of opportunity for employees
          - (5.) Lack of continuity
     2. Partnership
        - a. Advantages
          - (1.) Larger amount of capital
          - (2.) Credit standing
          - (3.) Combined judgement and managerial skills
          - (4.) Retention of valuable employees
          - (5.) Personal interest in business
          - (6.) Definite legal status

b. Disadvantages
   (1.) Unlimited liability of the partners
   (2.) Lack of continuity
   (3.) Divided control
   (4.) Possibility of disagreement among the partners
   (5.) Frozen investment

3. Business corporations
   a. Advantages
      (1.) Limited liability of stockholders
      (2.) Larger size
      (3.) Transfer of ownership
      (4.) Length of life
      (5.) Efficiency of management
      (6.) Ease of expansion
      (7.) Legal entity
   b. Disadvantages
      (1.) Taxation
      (2.) Organization expenses
      (3.) Government restriction and reports
      (4.) Lack of personal interest
      (5.) Lack of secrecy
      (6.) Charter restriction

LEARNING ACTIVITIES:

1. Charts on history of industry.
   Homework assignment: Poster depicting or tracing the historical development of industry.

2. View slide - film series "Activities of Industry" and discuss study guide.

3. List advantages and disadvantages for each of the three types of industry on a study guide.

MEDIA:

1. "Activities of Industry" (Film Slide Series), Describes and explains the six basic activities which are found to be common to nearly all types of industries. The six activities include: Product development, purchasing, manufacturing, industrial relations, internal finance and office service, and marketing. IM-29

Department of Industrial Education
College of Industry
Wisconsin State University - Platteville
Platteville, Wisconsin 53818

Chart #1 "This is the Industrial Revolution" 1959 22 " X 34" $.50 Graphically depicts the industrial revolution. IM-33

Do All Company
254 N. Laurel Avenue
Des Plaines, Illinois 60016

Chart #2 "Tools That Created Civilization" 35½ X 16-7/8" $.25 Depicts the historical development of the various hand hand and machine tools. IM-33

Do All Company
254 N. Laurel Avenue
Des Plaines, Illinois 60016

TEACHER PREPARATION:

1. Write for slide series and look viewing date.
2. Preview slide - film series and write student study guide.
3. Study guide for types of industry.
4. Arrange for and check on equipment - 35 minute slides.
5. Send for charts and check to see that they have been received.

RESOURCES:

Industriology Study Guide, pages 1 and 2.
Junior Achievement's Instructor's Guide.

SUPPLY NEEDS:

STUDENT ACTIVITY SHEET - "ACTIVITIES OF INDUSTRY (Slides)

Six activities of industry are:

1. Development and Design

   a.

   b.

   c.

2. Purchasing

   a.

   b.

   c.

   d.

3. Manufacturing or Processing

   a.

   b.

4. Industrial Relations

   a.

   b.

   c.

   d.

   e.

5. Internal Finance and Office Services

   a.

   b.

Activities of industry (Continued)

c.

d.

e.

5. Marketing

a.

b.

(Answer on a separate sheet of paper.)

Write a one page composition, using this work sheet as an outline, describing the activities of industry you saw on your field trip to Servomation.

INDUSTRIOLOGY - HOME ECONOMICS

Lesson # 4

GOAL:

1. To expand self-confidence by having each student work in areas requiring responsibility.

2. To improve a student's leadership ability through role playing.

PERFORMANCE OBJECTIVES:

1. Given a guide listing major areas of responsibility the student would expand the guide with specific student responsibilities.

2. Given a handbook and discussion time on parliamentary procedure the students will demonstrate their knowledge of proper parliamentary procedure by conducting an election and company meetings.

3. Given an organizational structure chart each student will either be elected or appointed to a position requiring responsibility.

4. Given a handbook or job description each student will participate in the company carrying out the duties of his elected or appointed position.

OUTLINE:

Internal Organization
- A. Formation
  - 1. Student responsibilities
  - 2. Election of officers
    - a. Parliamentary procedure
    - b. Officer's duties

STUDENT ACTIVITIES:

1. Discussion of student responsibilities with worksheet

2. Parliamentary procedure

3. Nomination of officers

4. Develop campaign for election

MEDIA:

TEACHER PREPARATION:

1. Develop student responsibility worksheet
2. Develop parliamentary procedure handbook
3. Organization chart printed
4. Officers Handbook
5. Job descriptions

RESOURCES:

Junior Achievement Advisors Manual

Junior Achievement "The Roots of Freedom"

SUPPLY NEEDS:

TEACHERS' GUIDE - STUDENT RESPONSIBILITIES

Economics might be a difficult subject when taught from a textbook and by lectures. In your company you will be putting into practice these complicated practices and theories.

Despite the size and complexity of the American industrial machinery it is not an inanimate object... it is P E O P L E.

PEOPLE create business and industries.

PEOPLE create society.

PEOPLE make the government.

Our economy is one of profit and loss, where investors are risking money in business ventures in hopes of gaining a profit. This is what your stockholders will be doing when they buy a share of stock. They will be entrusting their money to you to make it grow through your industry and management skill.

As a company member you must accept responsibility.

Responsibility to:

1. Fellow members - as a production worker, salesman, and director sharing with them and working the decision-making process.
2. Advisors - who gave their time and experience.
3. Stockholders - to use their money wisely.
4. Community - to demonstrate your ability.
5. Yourself - to use this experience to the fullest, for the dividends it will pay in enjoyment, social relationships, and preparation for your future.

STUDENT ACTIVITY SHEET

STUDENT RESPONSIBILITIES:

Economics might be a difficult subject when taught from a textbook and by lectures. In your company you will be putting into practice these complicated practices and theories.

Despite the size and complexity of the American industrial machinery it is not an inanimate object... it is P E O P L E .

P E O P L E create business and industries.

P E O P L E create society.

P E O P L E make the government.

Our economy is one of profit and loss, where investors are risking money in business ventures in hopes of gaining a profit. This is what your stockholders will be doing when they buy a share of stock. They will be entrusting their money to you to make it grow through your industry and management skill.

As a company member, you must accept responsibility.

Responsibility to:

1. FELLOW MEMBERS
2. ADVISORS
3. STOCK HOLDERS
4. COMMUNITY
5. YOURSELF

INDUSTRIOLOGY - HOME ECONOMICS

Lesson # 5

GOALS:
1. To develop an awareness of product research.
2. To develop an understanding of the function of and structure of a constitution.

OBJECTIVES:
1. Given a product the student will conduct a survey to determine the marketability and design of this product.
2. Given a statement of function and an outline of the structure the students will develop the constitution for their company.

OUTLINE:
1. Development and design of a marketable product
2. Constitution

STUDENT ACTIVITIES:
1. Research market
   Homework - Develop questionnaire for conducting student polls.

2. Design product - a. number to be made
   b. number days to be sold
   c. kinds

3. Write constitution

MEDIA:

Teacher Preparation:
1. Determine product: grinders
2. Guideline for writing a constitution.

RESOURCES:

SUPPLY NEEDS:

Dear Students,

This is a poll to determine what kinds of grinders you like the best. Please indicate whether or not you would buy grinders if they were available in the lunchroom and then mark with an X your 3 (three) favorite kinds.

Thank you for your co-operation.
Gwen Hampson, President
Grannie's Grinder Gallery Company
Kelcy Brooks, President
Serve-a-Sub Company

Yes_____ No_____ I would buy grinders in the lunchroom if they were available.

_____Meatball

_____Ham

_____Tuna Salad

_____Egg Salad

_____BLT

_____Salami

_____Bologna

_____Olive Loaf

_____Italian

_____Anchovie

_____Western

_____Hot Sausage

_____Roast Beef

_____Turkey

_____Chicken

_____Pepperoni

_____Pastromi

_____Meatloaf

INDUSTRIOLOGY PROGRAM

Home Economics

Goals: Lesson No. 6

To develop business experience and business contacts.

Performance Objectives:

1. Given guidelines the students will develop a perspectus for their company.

2. Given a format for a stock certificate the students will develop a stock certificate for their company.

3. Given an overview and a format for a simplified bookkeeping system the students in the company will keep accurate books.

Outline:

1. Perspectus

2. Stock Certificate

3. Bookkeeping

Learning Experiences:

1. Discuss and develop stock certificate.

2. Develop perspectus - capitalization.

3. High school bookkeeping class present system - awareness and price of overhead expenses.

Teacher Preparation:

1. Format for stock certificate

2. Guidelines for perspectus.

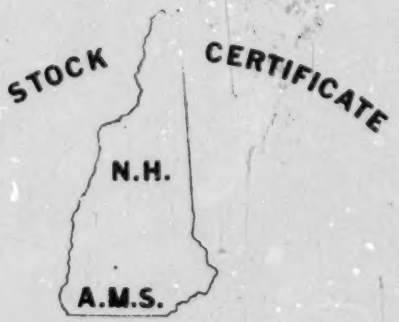
3. Confirm dates with bookkeeping class.

NON-LEGAL
One Share

PAR VALUE $1.00 (ONE DOLLAR)
LIMIT ONE SHARE PER PERSON

NON-TRANSFERABLE
CERTIFICATE NUMBER _____

REDEEMABLE WITHIN CURRENT
SCHOOL YEAR.
DATE: _____



THIS CERTIFIES THAT:

SAMPLE

_____
First Name Initial Last Name Number Street

_____ IS THE OWNER OF ONE
City State Zip Code

SHARE, PAR VALUE ONE DOLLAR OF CAPITAL STOCK OF _____

A HOME ECONOMICS COMPANY AT ANTRIM MIDDLE SCHOOL SUBJECT TO INFORMATION ON THIS CERTIFICATE.

_____ _____
Company Representative Stockholder

The stockholder by signature appoints the Company Representative to vote for election of Board of Directors.

ORIGINAL STUB One share $1.00 Certificate Number _____

INSTRUCTIONS:
DO NOT DESTROY IF FILLED OUT WRONG.
MARK SUCH CERTIFICATE "VOID" AND TURN IT IN. THIS STUB IS A CHARGE AGAINST SALESMAN FOR $1. CASH OR RETURN OF UNSOLD CERTIFICATE.
When form is issued, salesman fills in name and returns stub to person issuing certificate.

Company stock: _____
Issued to: _____
Address: _____

Date: _____ Issued by: _____

OVERVIEW

By having students organize and manage their own company, which is a simulated corporation, they will on a small scale be acquiring practical business experience. The students will be selling stock, purchasing raw materials, manufacturing products or rendering services. Officers elected by a Board of Directors will be responsible for keeping books, establishing wages and salaries, and managing company business. Before completion of the course the company will liquidate, paying off all stockholders, paying all bills, and disposing of all assets.

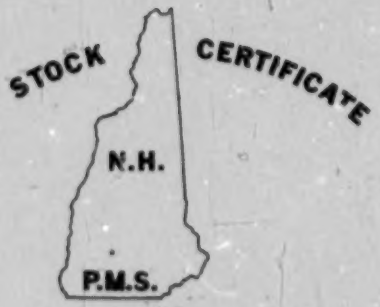
Special Features of This Stock Certificate

1. This non-legal non-transferable certificate is sold by authorized company representatives to provide capital for the operation of the student company.
2. This is a donation for educational purposes.
3. The stockholder by signature assigns the representative his proxy for election to the Board of Directors.
4. Upon dissolution of the company, stockholders receive liquidating values of shares.
5. This stock certificate is redeemable during the current school year.
6. The stub is on file in the Home Economics Department. In case of questions, please call Mrs. Grace at 1-588-6630.

NON-LEGAL
One Share

NON-TRANSFERABLE
CERTIFICATE NUMBER _____

PAR VALUE $1.00 (ONE DOLLAR)
LIMIT ONE SHARE PER PERSON



REDEEMABLE WITHIN CURRENT
SCHOOL YEAR.
DATE: _____

SAMPLE

THIS CERTIFIES THAT:

_____
First Name Initial Last Name Number Street

_____ IS THE OWNER OF ONE
City State Zip Code

SHARE, PAR VALUE ONE DOLLAR OF CAPITAL STOCK OF _____

A HOME ECONOMICS COMPANY AT PETERBOROUGH MIDDLE SCHOOL SUBJECT TO IN-

FORMATION ON THIS CERTIFICATE.

_____ _____
Company Representative Stockholder

The stockholder by signature appoints the Company Representative to vote for election of Board of Directors.

ORIGINAL STUB One Share $1.00 Certificate Number _____

INSTRUCTIONS:
DO NOT destroy if filled out wrong. Mark such certificate "VOID" and turn it in. This stub is a charge against salesman for $1. cash or return of unsold certificate. When form is issued, salesman fills in name and returns stub to person issuing certificate.

Company Stock: _____
Issued To: _____
Address: _____

Date: _____ Issued By: _____

OVERVIEW

By having students organize and manage their own company, which is a simulated corporation, they will on a small scale be acquiring practical business experience. The students will be selling stock, purchasing raw materials, manufacturing products or rendering services. Officers elected by a Board of Directors will be responsible for keeping books, establishing wages and salaries, and managing company business. Before completion of the course the company will liquidate, paying off all stockholders, paying all bills, and disposing of all assets.

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4. Upon dissolution of the company, stockholders receive liquidating values of shares.
5. This stock certificate is redeemable during the current school year.
6. The stub is on file in the Home Economics Department. In case of questions, please call Mrs. Grace at 924-7106.

RECORD OF STOCKHOLDERS

Company of _____ Year 19____

No.	Date	Certificate Number	No. Shares	Name First	Name Initial	Name Last	Address No.	Address Street	Address City	Address State	Zip	Paid Ck. No.

INDUSTRIOLOGY PROGRAM

Home Economics

Lesson No. 7

Goals:

1. To develop an understanding of industry and its social and moral obligations.

Performance Objectives:

1. Given a list of questions which pose problems between industry and society, each student will choose a media in which to reply to one question.

Outline:

A. Implications
   1. Social and moral obligations
   2. Labor Force
   3. Taxation.
   4. Government Regulations
   5. Ecology
   6. Technology
   7. Housing
   8. Money Needs
   9. Education
   10. Demands for Products

Student Activities:

1. Implications assignment (Assign #3).
2. Election of officers by secret ballot.
3. Introduce "Stock Market Game"

Media:

Game #1: Stock Market Game", #4821 1963 2-8 players. About $4.00. A game illustrating the nature of the stock market and the relationship to industry. IM-48

Whitman Publishing Company
Racine, Wisconsin 53401
(Or Local Store)

Teacher Preparation:

1. Ballot
2. Assignment on implications.
3. Be prepared to play "Stock Market Game"

Resources:

Industriology Study Guide P. 5

INDUSTRIOLOGY PROGRAM

Home Economics

Lesson No. 8

Performance Objectives:

1. By discussion and interaction with a speaker on advertising and product promotion the students will develop, design, and conduct their own advertising and promotion campaign.
2. Given an equal number of shares each student will sell these shares in accordance with company regulations.

Outline:

A. Marketing
   a. Advertising and promotion
   b. Newspaper
   c. Sales - methods
   d. Packaging
   e. Labeling
   f. Pricing

Student Activities:

1. Introduce advertising
   2. Hire help
   3. Speaker - Salesman
   4. Selling of Stock

Teacher Preparation:

1. Guidelines for selling brochure
2. Have printed structure chart
3. Arrange for speaker
4. Stock must be finished

INDUSTRIOLOGY PROGRAM

Home Economics

Lesson # 9

Performance Objectives:

1. Given the necessary ingredients the students will conduct experiments and statistically and/or graphically demonstrate quantity-cost relationship of their product.

Learning Experiences:

1. Results of poll (design product) 6 students.
2. Advertising campaign.
3. Homework - packaging, labeling, pricing.

Teacher Preparation:

1. Secure produce.
2. Assistance from M. Roberts
3. Arrange for media persons.
4. Written assignment.

INDUSTRIOLOGY PROGRAM

Home Economics

Lesson # 10

Goals:

1. To create a situation where students work necessitates the need for joint cooperation and communication.
2. To develop student awareness of job opportunities with the defined unit of study.

Outline:

A. Operation
   1. Industrial Relations
      a. Unions
      b. Jor roles
      c. Community
      d. Benefits

   2. Manufacturing or Processing
      a. Assembly line
      b. Quality control
      c. Storage
      d. Carry out bookkeeping system
      e. Do purchasing
      f. Cost analysis
         Break even charts

Student Activities:

1. Company President: Make Station Assignments
2. The groups that meet twice will make posters for station specifications.

Teacher Preparation:

1. Guidelines for Station Specifications.

H OME ECONOMICS COMPANY LIQUIDATION REPORT

_____ a Home Economics Company at _____
Company Name

Middle School in _____, _____
City State

announces that it has formally terminated, as of the close of business

on the _____ day of _____, 19 ____.

Receipts

Received From Sale of Stock	$_____
Received from Sale of Products	$_____
Other	$_____
TOTAL	$_____

Expenses

Raw Materials (List by Name of Vendor)

_____	$_____
_____	$_____
_____	$_____
_____	$_____
Office Supplies	$_____
Other	$_____
TOTAL	$_____

Stockholders of _____ shares of stock were paid:
$_____ a share-return of original investment of $1.00 per share
$_____
$_____ a share-declared dividend on earnings $_____
Total amount paid per share $_____

Return this portion to persons issuing stock.

I, a stockholder, accept the above Liquidation Report and liquidating value of the stock for _____ a Home Economics
Company Name
Company at _____ Middle School in _____,
City
_____.
State

Signed: _____
Stockholder
Stock Certificate Number _____

INTRODUCTION
TO
PAPER MAKING

INDUSTRIOLOGY PROGRAM

Contoocook Valley School District
Supervisory Union 47
Peterborough, New Hampshire

June 1973

7th & 8th Grades

Prepared by: Bruce McPherson
Robert W. Harkins
R. E. Rivest
Program Consultant: John L. Davy

Funded by: Project World of Work
PL 90-576

INDUSTRIOLOGY PROGRAM

Course Outline:

Title of Lesson	Lesson No.
PROGRAM DESIGN	
HOW TO PLANT TREES	100
1971 - A Pivotal Year for the Paper Industry	
IMPORTANCE OF PAPER	200
Imagine Your Day Without Paper	
Common Types of Paper	
HISTORY OF PAPERMAKING	300
YOUR PAPER MILL	400
Worksheet on Careers in the Paper Industry	
RECEIPT OF PAPER	500
MAKING YOUR OWN PAPER	550
HOW PAPER IS MADE	
PREPARATION & ADDITION PROCEDURES FOR RAW MATERIALS USED IN PAPERMAKING	
HARDWOOD & SOFTWOOD PULP	
EXPERIMENT - MAKING WOOD PULP	
RECYCLING OUR PAPER	600
RECYCLED PAPER EXPERIMENT	
HANDOUT - RECYCLING PAPER	
TEACHER RESOURCE INFORMATION	

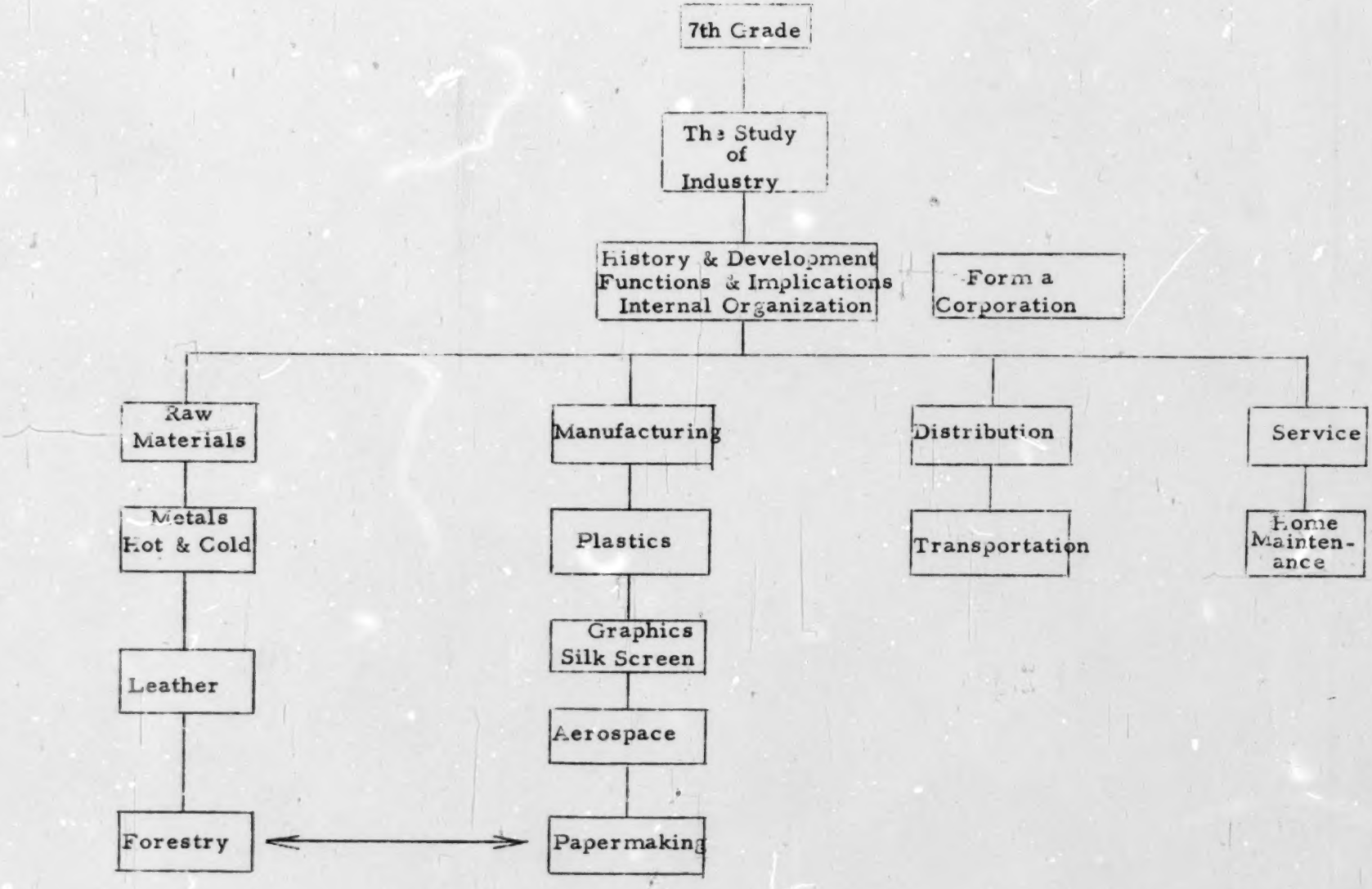
RECYCLING PAPER PRODUCTS

INDUSTRIAL PAPERMAKING - VISIT TO PAPER MILL 700

PROBLEMS OF AIR POLLUTION

WATER POLLUTION

THE PAPER INDUSTRY IN THE U. S. - FACT SHEET


7th Grade
The Study of Industry
History & Development
Functions & Implications
Internal Organization
Form a Corporation
Raw Materials
Metals Hot & Cold
Leather
Forestry
Manufacturing
Plastics
Graphics Silk Screen
Aerospace
Papermaking
Distribution
Transportation
Service
Home Maintenance

INDUSTRIOLOGY PROGRAM

Grade 7 Date _____

Lesson No. 100

Title of Lesson HOW TO PLANT TREES

Goals: To develop tree planting techniques.
To develop an understanding of different trees and their uses.
Each student will become aware of conservation and forrest management.

Student Activities:

1. Plant trees on school property
2. Show how soil erossion works and is controlled locally.
3. Have local conservation officer demonstrate and answer questions on conservation.
4. Plan activity on forest fire techniques and problems.

Performance Objectives:

1. From a sample of 10 different trees, the student will identify types, characteristics, and uses of 8.
2. Each student will plant 1 - 3 trees in the local forest.
3. Each student will show 1 case of soil errosion and explain how it could be controlled.
4. Each student will select 2 - 3 different trees and tell about them.

Teacher Preparation: (Film Guides to Develop, Worksheets, Arrangements for Trips, Speakers, Etc.)

1. Get clearance, (local source if possible) guidelines for research.
2. Contact conservation officer prior to lesson to get more information.

Contact: State Conservation Office
Milford,
New Hampshire

Speakers: Conservation Officer
Forest Ranger

Resources Needed: (Equipment, Resource People, Etc.)

Shovels, water, trees (Local conservation officer, if possible)

Supply Needs

Consumable Supplies	Non Consumable
Trees (400 Trees)	Shovels Buckets

Student Assignment:

Turn in a research project on the different kinds of trees and how they are recognized.

Develop Guidelines

Set up Recycling Areas and charts to be used in lesson # _____

1971 - A Pivotal Year For the Paper Industry

A Report Prepared by the American Paper Institute

The Industry's Commitment to Sound Forest Management

The 50 million acres of forest lands owned by paper companies, together with several million acres of leased lands, are a key element in the industry's raw material supply. Ownership or control by paper manufacturers enables them to apply principles of scientific forestry, assuring perpetual growth and increasing yields of usable wood; each year the industry grows more wood than it takes from its lands. Land management represents a large total effort by the industry, which is currently spending about $100 million annually to maintain and improve its timber properties.

Industry-owned lands -- taken together -- are the most productive commercial forest in the United States, yet they can supply only a part of the nation's increasing wood needs. The paper industry therefore urges the application of modern forest management principles to lands owned by others as well.

There was considerable controversy in 1971 over forestry techniques, especially as applied on public lands. One proven practice calls for harvesting trees in blocks of several acres or more. Sometimes called "even age management," or "clearcutting," it can promote faster regeneration and greater yields than other harvesting methods. Representatives of wood-using industries have communicated these facts to government officials to offset proposals for ill-advised restrictions on even age management, which, if imposed, would have serious impacts on housing, pulp and paper supplies, and other essentials.

Although industry-owned forests are dedicated primarily to fiber production, they are also dedicated to the principle of multiple use. More than 90 per cent of the woodland acreage owned by paper companies is open to the public for recreational use, and these lands also serve as watersheds and as habitats for wildlife.

INDUSTRIOLOGY PROGRAM

Grade _____ Date: _____

Lesson No. 200

Title of Lesson IMPORTANCE OF PAPER

Goals:

1. To develop an awareness of the many paper products.
2. To impress upon the student the importance of paper in today's world.

Objectives:

1. To familiarize the student with the many uses of paper so they have a knowledge of ten critical uses in our society today.

Student Activities:

1. Unit or Handout: "Imagine a World Without Paper
2. Film

   Title: "Paper And I"

   Color - Film

   Address: Jefferson Road
   Athens, Georgia 20601

   Stresses the dependence of people on paper products and how the demand can always be satisfied with proper management of resources.

   Title: "Paper: The Prologue"

   "A Modern Look at the History of Paper"

3. Discussion and question period on films.
4. Five to ten minute preparation on homework assignments.

5. Have students try to think of some new products that could be made of paper.

Assignment:

1. Have a few students do a unit on wall paper. Include colors, textures, etc.

2. Have some students develop a poster depicting ten (10) or more uses of paper in our society.

Teacher Preparation (Film guides, worksheets, field trips, speakers, Etc.)

1. Films ordered in advance and previewed.

2. Arrange for use of 16 mm projector

3. Write teacher guide with questions.

4. Unit on wall paper.
   A. Have list available of hardward stores or paint stores in area where students can get paper samples and information.
   B. Have a question sheet to aid students to prepare unit.

5. Development of Student Poster
   A. Have poster board available.
   B. Marking pencils (Magic markers)
   C. Information pamphlets
   D. Photographs or magizines to cut from
   E. Organizational sheet for procedure to make poster board.

6. A list of topics for discussion with students in class

Supplies and Resources Needed

Consumable

Posterboard
Paste
Magic Markers

Non-Consumable

A sample sheet showing categories from which students can draw information for finding samples of paper products to make a poster - board.

Paper Uses

1. News Print
   News Papers
   In expensive mailing pieces

2. Printing Papers
   Books
   Magazines
   Communications requiring good reproduction (letter and newsprint)

3. Fine Papers (High Grades)
   Stationery
   Bank Checks
   Maps & Charts
   Mimeograph

4. Course Paper (Heavy Duty)
   Wrappings & Packaging

5. Fruit Wrapping Box-Liners

6. Industrial Special Papers
   Abrasive Papers
   Fillers and Filter Papers
   Computer Cards
   Insulation Papers

7. Sanitary and other tissues.

8. Container Board
   Linerboard
   Corrugated Materials

9. Folding Boxboard
   Food Products Boxes
   Soap Powder Boxes

10. Special Foodboard
    Milk Cartons
    Other Dairy Cartons

11. Set-Up boxboard
    Made from waste
    Shoe Boxes
    Candy Boxes

12. Construction Paper
    Roofing Paper
    Floor Covering
    Automotive felts
    Insulating Board

Types of Pamphlets for Information to Build Posterboard of Paper Uses

INDUSTRIOLOGY PROGRAM

IMAGINE YOUR DAY WITHOUT PAPER....

Suppose - - - - during the "wee" hours of the morning all the paper in your world disappeared.

Can you picture the nightmare?

Now, list the first ten (10) items that are missing from your life. (You would have to list them on a non-paper material.)

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

As you open the refrigerator door to reach for the orange juice - - it runs on the floor. The cereal has no box, your car won't run, your television won't work. Do you have others?

Your assignment - Imagine your first day without paper and write one page about it or use a tape recorder and tell about this imaginary day.

INDUSTRIOLOGY PROGRAM

List of Common Type Papers

1. Kraft paper - brown bags, butcher paper.
2. Waxed Paper
3. Velim, onion skin, tissue paper, etc.
4. Clay coated Paper - Magazines, catalogues, etc.
5. Plastic Coated - Milk, butter cartons
6. Egg Cartons
7. Pamphlets
8. Cardboard
9. Carbon Paper
10. Paper Cups & Plates
11. Construction Paper
12. Newsprint
13. Stationery
14. Paper Towels
15. Freezer Paper
16. Oil Treated Paper

INDUSTRIOLOGY PROGRAM

Grade _____ Date _____

Tielt of Lesson HISTORY OF PAPER MAKING Lesson No. 300

Goals: 1. To develop an awareness of the processes of early paper making.

Objectives:

1. To develop within the student a knowledge of early paper processes to the extent that he can describe at least two early processes.

2. To develop within the student a knowledge of processes of early paper making to the extent that he can apply this knowledge in making his own paper.

Student Activities:

Films

Title: Paper Making In China
Color 16 mm - 14 Minutes

Address: Jones Division
Beloit Corporation
Pittsfield, Mass. 02103

This film depicts papermaking in China, going 1,000 years back and shows the hand process involved.

Title: The Power of Paper
Color 16 mm 27 Minutes

Address: P.H. Glalfelter Company
Spring Grove
Pennsylvania 17362

A panorama of paper making from ancient times.

Assignment:

Have a few students do a report on early Egyptian paper.

Have students bring in various types of paper for next lesson to be put on a display board (See Lesson #400).

Have students bring in a list of 6 or more jobs related to the paper industry for Lesson #400.

Teacher preparation (film guides, worksheets, field trips, speakers, etc.)

1. Order films in advance for preview.
2. Arrange for 16 mm projector.
3. Set up guide sheet for reports.
4. Prepare 15 minute talk or discussion for after film.

Supplies and Resources Needed:

Consumable Non-Consumable

INDUSTRIOLOGY PROGRAM

Grade _____ Date _____

Lesson No. 400

Title of Lesson: YOUR PAPER MILL

Goals:

1. Students will develop a knowledge of a variety of skills related to the paper industry.

2. Students will develop an awareness of the many types of paper

3. Students will develop a basic understanding of the major functions of the equipment in a paper mill.

Objectives:

1. Each student will identify and describe a major use of 6 different kinds of paper.

2. Given a diagram, each student will be able to place in order the operations of equipment used in a paper mill.

3. Each student will identify six different career areas involved in paper making. e.g., forest management, engineer, mathematician, computer expert, biologist, botanist, etc.

Student Activities:

1. Show film (see selection).

2. Students will make display boards of different types of paper for identification.

3. Students will prepare a list of various jobs in a paper industry and display them on bulletin board.

Assignment:

Have students bring in a list of 6 or more jobs related to the paper industry . (Pictures, if possible.)

Have students collect samples of different kinds of paper.

Teacher preparation (film guides, worksheets, field trips, speakers, etc.)

1. Read Fact Sheet, "The Paper Industry in the U.S."
2. Set up display board on specialty papers.
3. Pass out hand outs on paper making by the chemical process.
4. Send for film (s):
   A. "Day After Day" - 26 mins. (Black and White)
   B. "Paper and Pulp Making" - 11 Mins. (Color)
   C. "The Color Mill" - 18 Mins. (Color)

Supplies and Resources Needed:

Consumable	Non-Consumable
Display Board	Display board on specialty papers
Common Type Papers	

INDUSTRIOLOGY PROGRAM

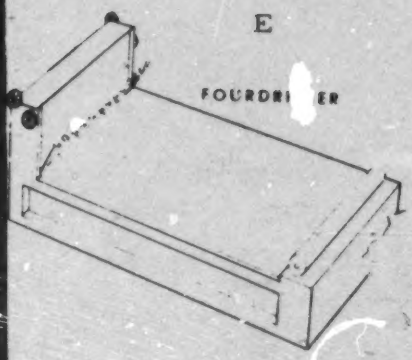
Worksheet on Careers in the Paper Industry

As you visit the paper mill, note the variety of jobs that people are engaged in. When you return from your visit, see if you can match up the jobs on the left with the description on the right.

Mathematician or Computer Expert	Looks for better ways of converting wood and waste paper into finished products.
Chemist	Improves the quality of paper for better printing or stronger packages.
Forester	Designs new and better machinery.
Physicist	Solves complex problems of operations research, production planning or mathematical problems.
Engineer	Finds way to boost the growth of woodlands.
Biologist	Helps to manage and improve the nation's vast woodland resources.

Match the following processes in the making of paper with the letter which corresponds to the order in which it is done.

E



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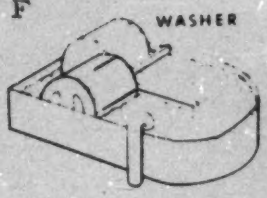

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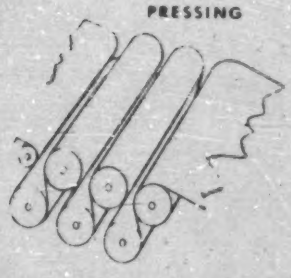

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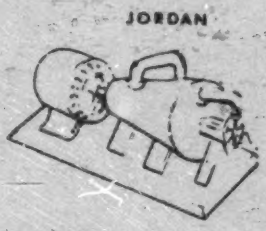

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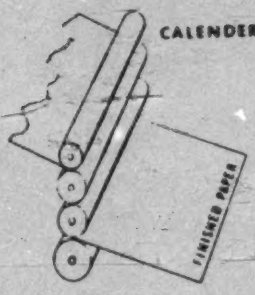
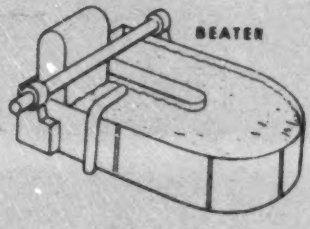


Step # 1 _____
Step # 2 _____
Step # 3 _____
Step # 4 _____
Step # 5 _____
Step # 6 _____
Step # 7 _____

D

DIGESTER

A



INDUSTRIOLOGY PROGRAM

Grade _____ Date _____

Lesson No. 500

Title of Lesson RECEIPT OF PAPER

Goals: To develop a knowledge of the ingredients necessary for the making of paper.

Objectives:

To develop an understanding of the relationship between the ingredients in paper and paper characteristics so that the student is able to identify five (5) ingredients of paper. To describe what each ingredient has added to the paper.

Student Activities:

1. Film: Paper and Pulp Making

   11 Min. - Color - Coronet Films

   Address: Coronet Films
   65 East South Water Street
   Chicago, Illinois

   Paper and pulp making processes from raw materials to finished product and importance of paper industry to daily living.

2. Make five (5) sheets of paper adding in one (1) ingredient at a time between sheets.

Assignment:

Each student will bring information on careers in papermaking for one (1) large bulletin board or collage. Bring paper samples.

Teacher preparation (film guides, worksheets, field trips, speakers, etc.)

1. Arrange for 16 mm projector.

2. Have all ingredients for papermaking in stock.

3. Obtain utensils for mixing pulp. (Develop list)

4. Develop vocabulary list.

5. Worksheet on ingredients and their properties.

Supplies and Resources Needed

Consumable

Pulp
Laundry Starch
Wax Paper
Felt
Sponges
Dyes (Red, Yellow, Blue)
Titanium Dioxide
Clay
Rosin
Melamine Formaldehyde
Alum (Acid)

Non-Consumable

Screening
Wood Frames
Blender
Iron
Vat or Pan (3" to 10" Deep)
Waterproof Work Surface

INDUSTRIOLOGY PROGRAM

Grade _____ Date _____

Title of Lesson: MAKING YOUR OWN PAPER Lesson No. 550

Goals: 1. To develop an understanding of the process of papermaking.

Objectives:

Each student will develop an understanding of the process of papermaking to the extent that he can make one (1) white sheet and one (1) colored sheet, of paper.

Student Activities:

Students will tear pulp in small pieces and mix with water in blender. Blend till tissue or pulp fibres are dispersed in water. Then pour them in a large vat of water and starch. With a rectangular screen, screen side up, remove a balance of pulp residue from the water on the screen inside the empty frame placed on the screen of the rectangular screen frame so all pulp is on screen. Place screen over a sponge or felt, screen side down, and press water from pulp. When fairly dry it can be removed from screen gently and placed between wax paper sheets and iron out retaining water. The process should be repeated with dye added to water for colored sheets.

Student Activites:

One should be made without starch, so difference can be seen. Care should be taken to work only with equipment that can stand water,

Examine pulp under microscope. Put torn edges of the paper they made under microscope. Take walk behind school in woods and identify soft and hard woods, etc.

Assignment:

Reports on different processes of papermaking.
Have students find information about different careers in papermaking.

Making Your Own Paper Lesson No. 550

Teacher preparation (film guides, worksheets, field trips, speakers, etc.)

Develop A Vocabulary List.

Possibly a field trip to paper mill can be arranged. Check flow charts on bulletin board. Prepare products list. Have samples of different texture and colored papers available for feel and sight.

Set up and show paper samples. (Get microscope to examine wood pulp and paper samples.)

Supplies and Resources Needed:

Consumable

Pulp or Cleansing (Facial Tissue)
Approx. 1/2 more paper than sheets to be made
Laundry Starch
Wax Paper
Blotters (Felt)
Dye (Red, Yellow, Blue)
Titanium Dioxide
Starch
Clay
Rosin
Melatine Formaldehyde
Alum (Acid)

Non-Consumable

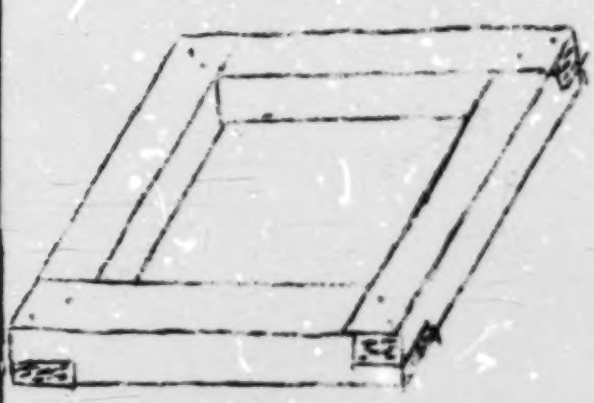
Screen
Wood Frame 9 1/2" X 11 1/2" Inside
Blender
Large Vat or Pan 8" to 10" Deep
Sponges to Fit Frames
Working Surface that can stand water
Iron

LESSON NO.
550

BLENDER

FELT PADS SEWN
TOGETHER

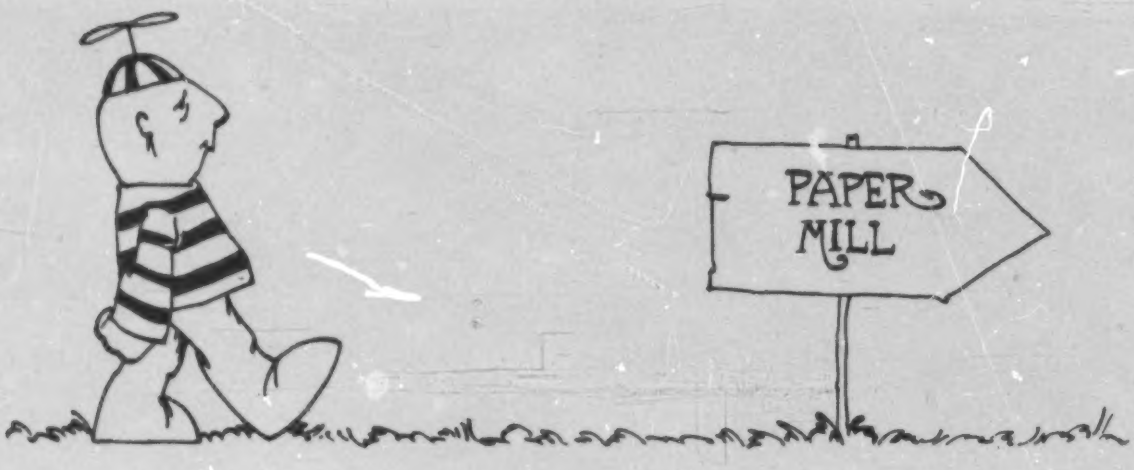
WOOD FRAME



2 REQUIRED

SCREEN

HOW PAPER IS MADE



Papermaking is actually not a complex process but it can be complex, depending on the quality of your paper. Papermaking involves many related operations, the first of which involves the actual cutting of trees. Do you know of anyone who is cutting lumber near your home or school? The papermills may use this type of lumber or they may use other sources such as waste from other companies.

Wood makes up about 95% of all paper. The remaining 5% is made up of cloth fibers such as rags, cotton, hemp, flax and other fibers. Recycling of waste paper and the use of waste wood could greatly reduce the drain of wood from our forests. Any paper such as bond paper, writing paper, old magazines, newspapers, etc., can be recycled. (However,

read the article on recycling to see both points of view.)

The production of paper not only uses much manpower, but complex machinery and skilled technicians to operate and maintain them.

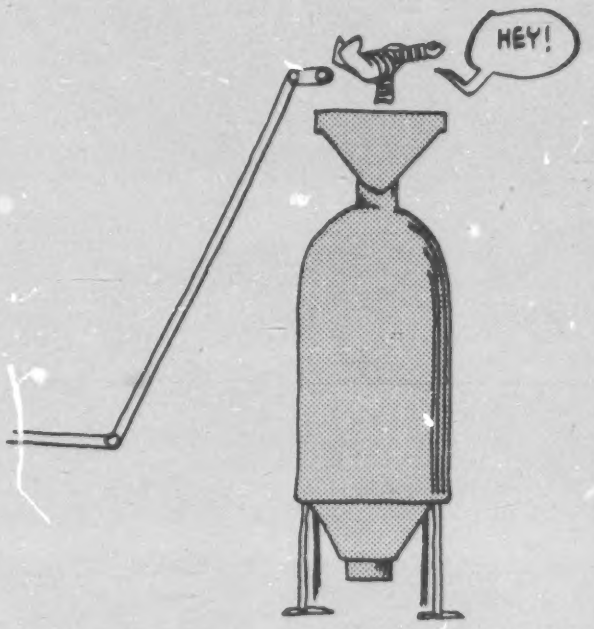
The chemical portion of papermaking involves not only chemicals used, but the chemistry of wood. Wood is made of cellulose fibres held together by a glue-like substance called lignin. Through these fibres flow the sap and resins of the tree.

Before the cellulose fibres can be used, all lignin, sap, and resins must be removed. This is done by a chemical process and the result is called "chemical pulp".

The chemical process used may have many variations. Among these are: sulphate (or kraft), soda, semi-chemical, sulphite, and cold soda processes. Using these processes produces different kinds of pulp. For example: a sulphate solution is used to make "kraft" (meaning strength) papers for grocery bags and wrapping for packages.

The mechanical process of production involves slicing the lumber which has been cut, into chips 1" square and 1/8" thick. These chips may now be reground by huge, high speed grindstones into small particles. The resulting product is known as "ground wood pulp". Used extensively in making newsprint (newspaper) and other high speed printing operations, it lacks the strength of most chemical pulps.

The wood chips are usually fed into vats called digester, which may be 3 - 4 stories high, is like a giant pressure cooker. Chemicals are also added to the wood chips and the mixture is steamed until an oatmeal-like mass is formed.



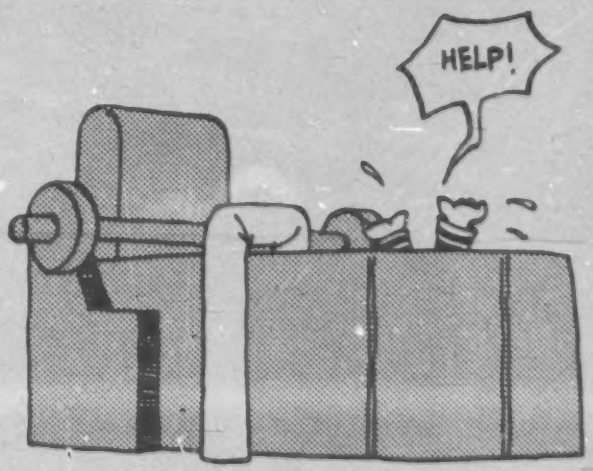
During this steaming process all the lignin, sap, and resins have dissolved

and become suspended in water. The pulp is blown from the digesters to separate the individual fibres and then washed to remove chemicals

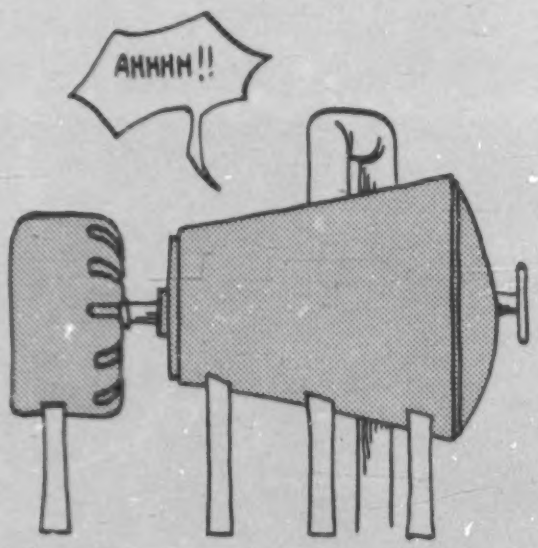
and other impurities. The result is nearly pure cellulose. If white paper is desired, the pulp is now bleached.

The beaters, which are metal knives or bars, pass through the suspended pulp to complete the separation, cut to length, and fray the edges of the fibres.

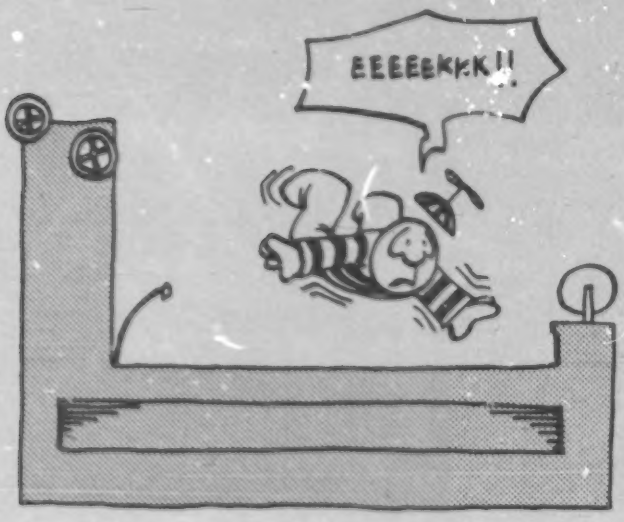
Any colors (dyes), or other chemical can now be added.



The refiners (Jordan engines) now cut the fibres to uniform size and further brush them to improve cling, so they will form sheets.

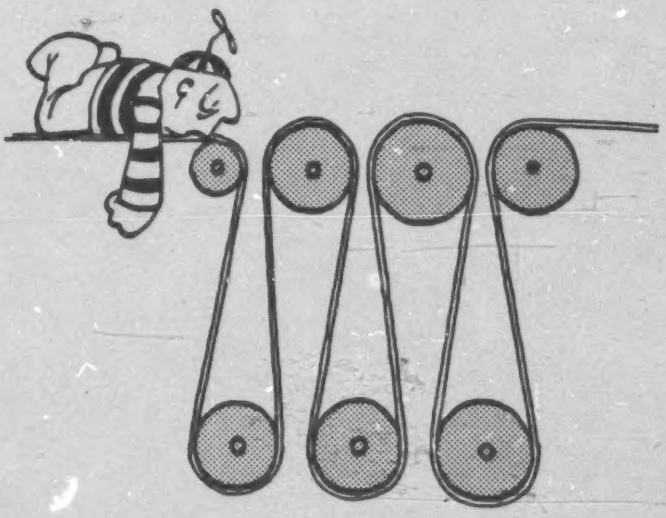


The final steps are carried out on the paper machine. The pulp which is 99% water, is run onto an endless mesh screen called the "Fourdrinier wire", on the "wet" end of the machine.



A side to side vibration interlaces the pulp fibres to make sheets and water is extracted by suction pumps. The sheets pass between two sets of hot drum rollers which press and dry the pulp slightly.

Traveling at various speeds sometimes faster than 3,000 ft./min. The sheets wind along on a "felt blanket", over and under a long series of steam heated cylinders, called "dryers",

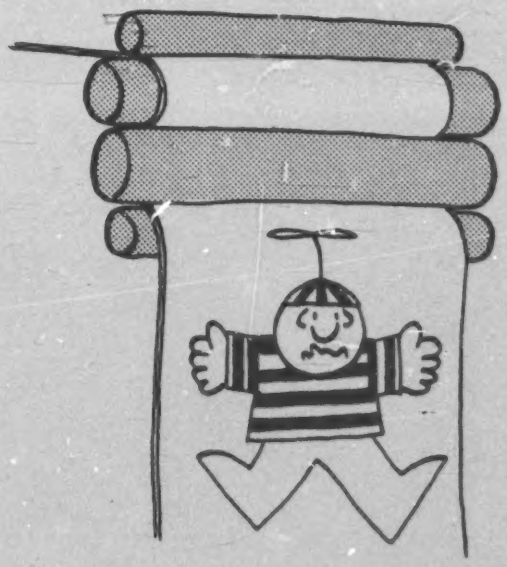


some wide enough for paper 25 feet wide. This acts to remove the remainder of the water by pressing and evaporation.

Callendering, which provides a glass-smooth finish, is the process of ironing continuous sheets of paper between heavy, polished metal

rollers.

The paper may also pass through tubs of chemicals for further coatings.



After finishing, the paper is wound into large rolls which go to a "winder" on the end of the paper machine. Here the large rolls may also be forward or reverse wound onto paper or metal cores. In the case of "Stretchy" papers, such as "crepe" paper, no core may be used.

The final step for much of the paper is to be further callendered by "super callenders", which put a very high gloss onto the paper. This is done by again weaving the paper through many heavy, polished, metal rollers.

All paper produced is now packaged and sent to converting plants to be made into thousands of different useful products.

INDUSTRIOLOGY PROGRAM

Preparation and Addition Procedures for Raw Materials Used in Papermaking

1. Most paper made on Fourdrinier paper machines have the raw materials (stock) at approximately .5% consistency when it is sent to the forming wire. This consistency would probably also be best for making paper by hand.

2. To make a .5% consistency pulp slurry, 1 lb. of pulp would have to be added to approximately 2 00 lbs. of water (24 gallons). The 1 lb. of pulp will make approximately 100 - 8 1/2" sheets. In order to fully disperse all of the fibers in the pulp sheets, small amounts of the pulp should be mixed with water in a blender and then further diluted down to .5% consistency. A combination of hardwood and softwood rip should be used. (60% hardwood, 40% softwood)

3. You have been supplied with two types of pulp -- Hardwood and Softwood -- both were made using the kraft pulping process. This process removes the lignin that bonds wood fibers together. Once the lignin is removed, the individual cellulose fibers, which wood consists mostly of, breaks apart and converts into what is called pulp. In many cases, this pulp is then bleached to remove the natural yellow-brown coloring. As you can observe, the softwood fibers are approximately 3/8" long, compared to approximately 1/8" length for the hardwood fibers. The longer softwood fiber will produce a stronger sheet of paper, because of its larger surface area that will give more areas for physical and chemical bonding to other fibers.

4. Paper made from 100% fiber will not have a very high opacity. The addition of 6 oz. of clay to the 1 lb. slurry of pulp will produce a sheet considerably higher in opacity and probably slightly more yellow.

5. To make a very highly opaque and bright sheet similar to some of the high-priced papers used in offset printing, add 6 oz of titanium dioxide in place of the clay. Combinations of the clay and titanium can be mixed to produce sheets of lower quality and cost.

6. The paper that you have made up to this point has no water resistance. Upon contact with water, it will act similar to blotter

paper. To add water resistance to paper, 1 oz. of Rosin Size, a by-product of the softwood pulping process, will have to be added to the .5% consistency stock slurry. In order to set the Rosin on the fiber, 2 ml. of Alum (Aluminum Sulfate), which is a weak acid, will have to be added. (Even though Alum is a weak acid, caution should be used in handling the concentrated solution.)

7. The .5% stock slurry should be well mixed between and after the addition of the two chemicals.

8. All the paper you have made to this point has been basically white. You have been supplied with 3 dyes -- a red, yellow and blue. With these 3 primary colors, any color paper you want can be made. The dyes you have received are in powdered form. 15 gm. of any of the dyes will produce a fairly deep color. It is best to pre-dissolve the powdered dye in hot water before adding to the pulp slurry. The Rosin and Alum should be added before the dye is added. The die should be dissolved in hot water then added to the solution.

9. Once the Rosin and Alum have been added, you can make a sheet that in addition to water resistance, will have wet strength. A wet strength chemical (melamine formaldehyde) is added to paper to be used for such things as outdoor posters or wallpaper, so that it will not easily break apart when it gets wet. If you desire to make a sheet of paper which will have wet strength, add 2 oz. of the wet strength chemical to the 1 lb. of stock slurry. (Caution should be used in the handling of this material also.)

10. In order to give the paper you have made some additional strength and surface abrasion resistance, the sheet after it is dried should be dipped into a 15% starch solution and then re-dried. The starch solution is made by adding approximately .6 lb. of the dry starch to 1/2 gallon of water. Cooking the starch at a temperature above 190° F. for approximately 20 minutes will dissolve the starch granules and produce a clear starch solution. The starch should be kept hot at all times.

Mixture for:

25 Sheets	1/4 lb. Pulp	6 Gallons Water

Pulp - 113.4 g

Clay - 42.52 g gives opacity

Titanium or Dioxide 42.52 g opacity brightness

Rosin Size 7.09 g water resistance

Aluminum Sulfate 1/2 ml Set Rosin

Dye 4 Grams (Dissolved in hot water)

Melamine Formaldehyde 14.18 g Strength

Starch 1/2 lb. or 25 g: 1/2 Gal. H20 Cook 20 minutes 190°

Starch should be kept hot during use.

Hardwood and Softwood Pulp

Both of the attached pieces of pulp were made using the kraft pulping process. This process removes the lignin that bonds wood fibers together. Once the lignin is removed, the individual cellulose fibers, which wood consists mostly of, breaks apart and converts into what is called pulp. In many cases, this pulp is then bleached to remove the natural yellow-brown coloring.

Softwood Pulp - Note the fibers are approximately 3/8" long. The softwood fibers will produce a stronger sheet of paper. Why?

Hardwood Pulp - Note the fibers are approximately 1/8" long.

INDUSTRIOLOGY PROGRAM

EXPERIMENT - OPTIONAL

MAKING WOOD PULP

Note to Teacher: Supervision of Handling of Acid is Recommended.

Materials Needed:

1. Soft pine (to make wood chips).
2. Two (2) baby food jars (medium size).
3. Two (2) large fruit jars.
4. Small pieces of wood for stirring sticks (6" dowel).
5. Stick (3/4" X 3/4" X 12" pine) for breaking chips into fibers.
6. Nitric Acid.
7. Sodium Hydroxide.
8. Laundry Bleach.
9. Burlap.
10. High Rag Content Paper.

Pulp is made by breaking wood chips into fibers by first softening them with caustic solutions, then breaking them into fibers.

Question: What insect makes a paper-like material?

Procedure:

A. First cut your soft pine into wood chips 1/2" to 1" long.

B. Place the wood chips in the medium size baby food jar (about 1/2 full), place the safety goggles and rubber gloves on, then cover the wood chips with nitric acid. (Check wood chips periodically to insure that they are still covered with nitric acid.

1. Carelessness with acid will result in serious burns.

2. Place jar in safe place (where people will not break it).

3. Keep a solution of baking soda and water to wash off acid if an accident occurs.

C. Let the chips stand overnight, then add sodium hydroxide to neutralize. When the wood chips are soft, carefully break them into fibers using the block of pine (3/4" X 3/4" X 12")

Be careful not to splash solution. Continue to mash until the fibers reach a "mushy" stage.

If a rag content paper is desired, add pieces of high rag content paper to the solution and repeat the overnight acid bath and mashing process.

D. Place pulp in a large can (such as a fruit can), add water and stir fibers into solution.

E. Place burlap over the can and strain water from pupl fibers.

Do this a number of times (at least 2 - 3) to remove salts formed by neutralizing acid.

F. Place pulp in jar with bleach and stir until the pulp is white.

C. Place the pulp in the can and strain two more times.

H. Store the pulp wet until you are ready to make paper. Vegetable dyes may be added for tinting.

INDUSTRIOLOGY PROGRAM

Grade: 7 Date: _____

Lesson No. 500

Title of Lesson RECYCLING OUR PAPER

Goals: 1. To develop and understanding of the recycling process and its relationship to the preservation of our natural resources.

2. To develop student awareness as to the problem of waste paper in their school over a period of time. (To begin with lesson #100 and to be completed with this lesson.)

Objectives:

1. The student will be able to list three (3) problems encountered in the process of making recycled paper.

2. The student will be able to explain the improvements and effects of the paper mill on our environment.

3. The student will develop a chart depicting the sources of paper polution within the school.

Student Activities:

1. Each student will make a sheet of recycled paper from different types of pulp.

2. The students will be given handouts and asked five (5) questions on what is being done by paper mills to improve our environment.

Assignment:

1. The students will collect and store enough different types of waste paper from around the school, beginning with lesson #100, to make recycled paper.

The student will also make flow charts showing which section of the school was the biggest consumer of waste paper during this time period.

Teacher preparation (film guides, worksheets, field trips, speakers, etc.)

1. Obtain handouts; recycling paper to be given to the students.

2. Coordinate the waste paper to become recycled paper. (See experiment.)

Supplies and Resources Needed

Consumable

1 Pound Tissue
Softwood or Hardwood Pulp
Paper Towels

Non-Consumable

20 Gallon Container
1 Gallon Container
Screens and Frames
Blenders

INDUSTRIOLOGY PROGRAM

Recycled Paper Experiment

Materials Needed:

20 Gallon Container
1 Gallon Container
1 Pound of Paper Tissue
Screen and Frame
Blender
Other Paper Contaminents
Paper Towels

To demonstrate some of the problems which face the paper manufacturing industry in an attempt to increase the amount of "second time around" fiber in its products, try the following experiment.

Shred 1 lb. of white tissue or bleached pulp. Add 4 to 5 pieces of approximately 2" square pulp to 30 - 40 oz. of water and thoroughly blend. Pour mixture into a large container (at least 20 gals.) and repeat process until all pulp is dissolved. After all pulp is dissolved, add water to make 20 gallons.

Obtain one screening of this mixture. Describe the appearance of this sample.

The next step is to add 1 pound of various contaminants (see attached list), to the clean mixture. Add 2" square pieces of two or three contaminants; carefully observing the mixture and obtaining a screening after each addition. How does each screening differ? Continue until all of the different contaminants are used. Describe the overall effect of adding unsorted and uncleaned waste paper to the original mixture.

List of Various Contaminants

1. Newsprint.
2. Catalogues or magazines (clay coated).
3. Pamphlets.
4. Stationery (Air Mail - light weight, onion skin)
5. Cereal boxes, shoe boxes, shirt boxes.
6. Milk Coated (Polyethylene coated)
7. Egg Cartons
8. Cardboard Boxes
9. Wax Paper
10. Paper Towels

11. Metal Coated, Industrial Paper
12. Oil Treated, Kraft Paper
13. Freezer Paper
14. Kraft Paper (Brown Bags)
15. Insulating Paper

Recycling Paper

Handout

We have with us today a new breed of concerned people who see with freshly opened eyes that our society is based on a "use and discard" way of life. The statistics which shock them start with the volume of materials discarded per capita and the growing effect when people are crowded together in cities. For example, A. Stewart Hale, editor of Chem. 26, a trade magazine, tells us that the city of New York generates One Thousand Tons of Solid Waste Per Hour, twenty-four hours a day, 365 days a year. It costs the tax payers $36 a ton to dispose of it, or close to $300,000,000 per year.

What is "solid waste"? Of the estimated 4 billion tons produced annually in the United States, animal wastes account for about 2 billion tons, mineral wastes about one billion tons, agricultural wastes nearly 550 million tons, household and other municipal wastes about 300 million tons and industrial waste almost 130 million tons. It is predicted that solid wastes generated in the cities will more than triple by the year 2000.

How much of this waste is reuseable? Quite a lot, and industry has been tapping this resource for a long time. Steel, for example, uses 52% secondary material, paper 45% and glass 15% at the present time.

During World War II, the U.S. actually returned 40% of all paper produced to the mills for recycling. This is now back down to 20 - 22%. Many countries, with poor access to virgin fiber, do a better job than we. West Germany, for example is up to around 50%, England and Japan about 40%

Recycling in the paper industry takes many forms. A boxboard mill purchases mixed waste, grinds it up and forms it into several dark and dirty-looking plies which will be covered by outside plies made of bleached virgin pulp. This goes into the folding boxes used in department stores as gift boxes, suit boxes and the like.

All other materials collected for re-cycling require sorting and rejection of wrong types before they are allowed to enter a papermaking system. In addition, all of the other materials which have been used, such as dyes, fillers, sizes, coatings, wet strength agents, etc. must be removed and thrown away. In heavily coated paper such as that used in slick paper magazines, advertising brochures and the like, nearly half of the weight of the purchased waste paper

is thrown away. This is costly not only becuase of the shrinkage, but also because of the cost in equipment, manpower, energy and chemicals used to recycle paper. This also brings up another point often overlooked. A mill using large amounts of waste paper must spend a great deal of money to avoid polluting the air and water when it comes time to throw away the waste from the recovery operation.

A third, and important paper recycling operation has to do with clean unused paper which accumulate when large sheets and rolls of paper are made into items such as envelopes, business forms, ledgers, punch cards, tissues and many other paper products. These can be used in almost any way that clean (bleached) uplp can and there is always a big demand for such a clean and useful raw material. As a result, the price is also high.

Teacher Resource Information

1971 - A Pivotal Year For The Paper Industry

A Report Prepared by the American Paper Institute

RECYCLING AND RESOURCE RECOVERY

Nearly half of the fiber used by paper and paperboard mills in the United States is from reclaimed waste, making the industry one of the leaders today in resource recovery -- a fact not generally understood by the public. Twenty-two percent of the industry's fiber comes from waste paper, 23 per cent from wood residues such as sawdust and chips generated by other forest industries, and about 2 percent from miscellaneous wastes. Use of waste paper increased by 3.4 percent between 1970 and 1971, a rate of increase above that of total paper and paperboard production.

The paper industry's long-established and expanding practice of waste reclamation represents a positive approach to the enlargement of fiber supplies as well to the alleviation of the nation's solid waste problem.

President Nixon, in his environmental message early in 1971, callef for government efforts to encourage reclamation. In response, the General Services Administration (GSA) developed, during the year, requirements for the inclusion of definite percentages of waste fibers in paper and paperboard products purchased for government use. The GSA recognized in its specifications the broad concept of resource recovery and called for the employment of many kinds of fibrous wastes -- from wood residues to used paper. This has become a reasonable guide for public and private agencies to follow.

Late in 1971, the GSA began a limited test program of corrugated box and tissue purchases that require the inclusion of certain percentages of "post-consumer" wastes. This program has encountered some difficulty. Not all manufacturers are equipped to use such wastes in producing paperboard for corrugated boxes, and there is but a limited supply of the waste grades that can be used as substitutes for woodpulp in making tissue.

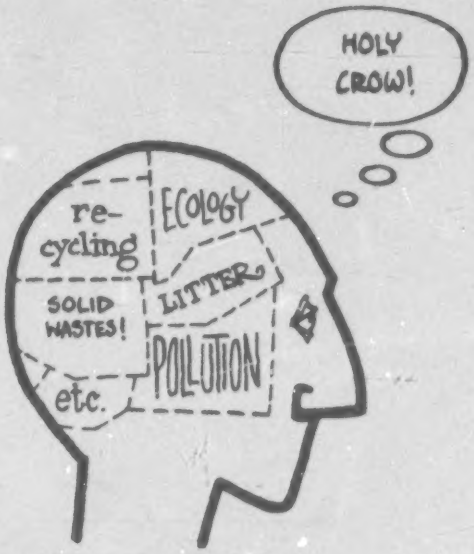
Throughout the year, growing interest in recycled products caused a flood of inquiries about their availability and costs. State and local governments, as well as corporations and institutions, began to specify the use of reclaimed fibers in paper they purchase. This, together with the quickening demand for construction paper and board, brought about shortages of certain waste paper grades in some areas.

In 1972, the waste paper supply could become tighter. The American Paper Institute's Paper Stock Conservation Committee is vigorously pressing its efforts to increase the supply of good quality paper stock.

Spurring the reuse of resources can help substantially to reduce the nation's solid waste problem. Assisting in this activity are two organizations actively involving the American Paper Institute and its members. The first is the Solid Waste Council of the Paper, Paperboard, and Packaging Industries. It is made up of ranking executives and is devoted to developing and promoting sound approaches to the control of solid waste. This group works closely with the National Center for Resource Recovery, an organization sponsored jointly by industries making and using such basic materials as glass, metal, paper, and plastics. The Center, founded two years ago, provides technical assistance to municipalities installing new refuse systems; it is now working to help establish in several cities across the country demonstration facilities to separate solid wastes for recycling, energy generation, and other reuse applications.

RECYCLING PAPER PRODUCTS

Have you thought much about the terms "ecology", "recycling", "solid waste", littering", and "pollution"? The problems that these words describe are not new so why is there more concern today than years ago?



Many of the products today are not designed for long use and, after a short while, are discarded by people.

On the following page, list at least three methods of "disposing" or "discarding" such objects and one disadvantage of each.

Method	Disadvantage
1. _____	_____
2. _____	_____
3. _____	_____

The list of discarded objects is a long one, and paper, the subject of our study is only one item. There are bottles, cans, automobiles, clothing, and furniture to name a few others. Think about some things you've thrown away this week.

There is no doubt that Americans use a lot of paper (550 pounds per person per year).

Do you use this much paper each year?

Describe your uses of paper during one day. What you use, how much and what you do with what you use.

_____

_____

_____

_____

_____

Most of our paper is used once and is either discarded, and adds to our water pollution or our air pollution. Doesn't the best solution seem to be to return as much paper to the mills to be re-used or "recycled"?

People who make paper will tell you that this is not easily done. Let's look at some of the problems.

1. Who collects the paper?
2. Who transports it to the mills?
3. What do the mills do with the chemicals that are used to clean the used paper?

PROBLEM #1 Who Collects the Paper?

Do you separate your papers, magazines, milk cartons, grocery bags, cereal boxes, meat wrappers, etc. from the rest of your garbage?

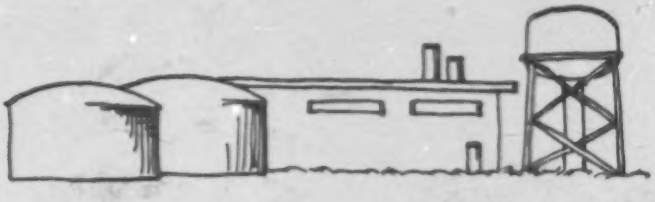
If you don't, then be careful about blaming "them" for paper pollution.

PROBLEM #2 Who transports the paper to the mills?

Probably the transportation could be solved providing all people brought their paper to a central location.

Do you?

PROBLEM #3 What do the mills do with the chemicals that are used to clean the used paper?



Before the fiber can go into a new supply of better grades of paper it must be freed from contaminants, washed and possibly bleached.

By the time the mills develop ways of disposing of the inks, clays, adhesives, staples and other trash removed from the fiber the costs have risen and made your paper more expensive. Check with your local mill and find out what they are doing with this problem. However, recycling can be successful if:

1. The final product is a low grade and can be made from any mixture. List some products that can be made from recycled paper.

_____

_____

_____

2. The waste has not been previously used but comes from a paper converting operation. (Such as an envelope factory.)

List two other sources of such clean material.

1) _____

2) _____

Can your class do a study on the use of paper within your school? Try to make a large chart showing where the waste paper comes from, then find out where it goes. Can a plan be devised to establish a recycling center for the total school?

INDUSTRIOLOGY PROGRAM

Grade _____ Lesson No. 700 /

Date _____

Title of Lesson INDUSTRIAL PAPERMAKING - VISIT TO A PAPER MILL

Goals:

1. To motivate students on papermaking as a followup to the activity of making their own paper.
2. To expose students to the processes of papermaking as done in large industry.

Objectives:

1. Students will develop an understanding of major operations in the paper making process to the extent that they can develop a flow chart on these processes.

Student Activities:

Field trip to Monadnock Paper Mills.

Assignment:

Test on matching to be given after the field trip.

Teacher Preparation (Film guides, Worksheets, Field Trips, Speakers, Etc.)

1. Arrange for field trip.
2. Permission slips.
3. Transportation
4. Lunch
5. Student list.
6. Chaperones
7. Obtain flow chart for teacher use.

PROBLEMS OF AIR POLLUTION

During the past few years the air pollution problem has greatly increased. Think about "why" this has happened!!

Can you list 3 or more reasons for the increased air pollution?

1. _____

2. _____

3. _____

Others:

Papermills have also contributed to the air pollution. The amount of pollution by each mill depends on several factors. Some mills start the papermaking process with wood, wood chips, sawdust or shavings while others start with a clean, bleached pulp.

The chemicals that are used to break down wood fibers can produce an acrid smell.

Even the fuels that the mills use themselves act as pollutants. The results are often harsh smells and clouds of smoke.

Weather conditions can also aggravate this pollution. A "lid" of "thermal barrier" on the lower atmosphere occurs under a certain condition known as "temperature inversion". When this occurs, the rising plume of smoke is held at low levels.

Wind conditions also play significant role in dispersing smoke from smoke stacks. A no wind co.diction allows odors and dust to rise and

become quickly dilluted at higher levels.

A light wind, though, allows the polluting smoke to travel along the ground - sometimes for miles.

A strong wind has a churning action that quickly mixes and dissipates pieces of dirt and dust.

Check your dictionary for the definitions of:

1. DISPERSE: _____

_____

2. DILLUTE: _____

_____

3. DISSIPATE: _____

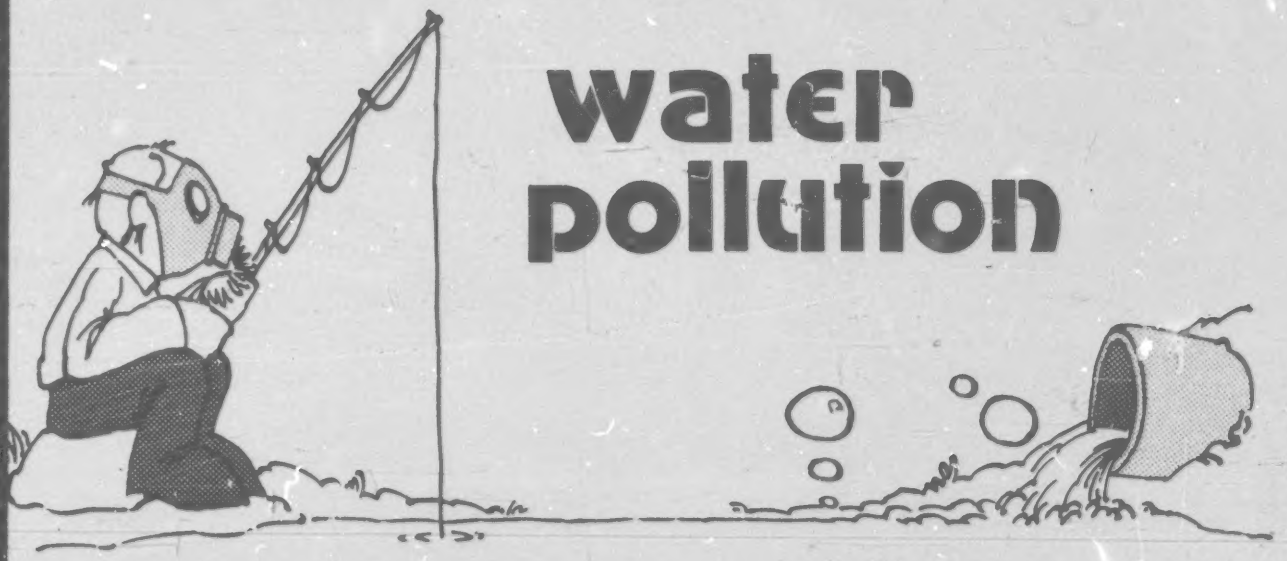
_____

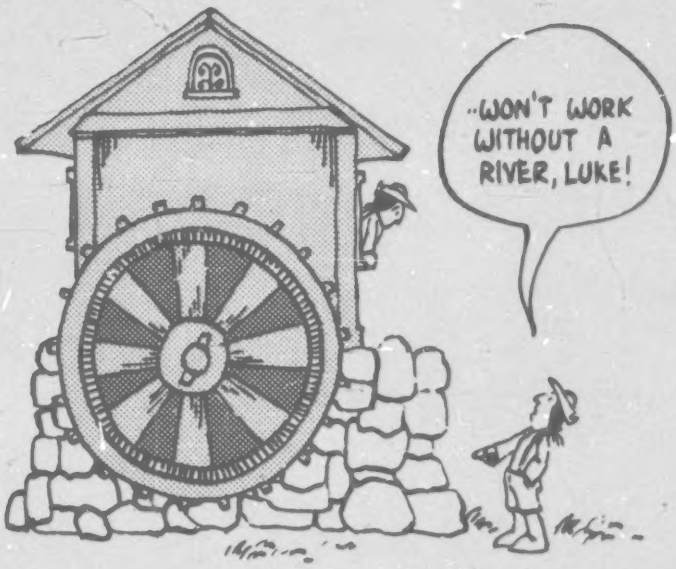
I'm sure you can see that dispersing, dilluting or dissipating does not really solve the air pollution problem.

For your assignment think about the problems that companies may have in solving the problem; think about the people who work at that company.

Think about your community, then as a group, write one letter politely asking a company how they are approaching the problem of air pollution.

water pollution





One of the most important ingredients in the pulping process and the papermaking process is lots and lots of water. Can you look on a map and point out several areas of the country where papermills might be located?

In the early days, most of the power needed to run the machines was from waterpower.

Therefore, the best place for a pulp and papermill was on a good-sized river or along the sea coast. River water was used for the processes and the waste was dumped in the ocean for the waves and tides to dilute and disperse the water.

Can you define: DILUTE and DISPERSE ?

DILUTE: _____

_____

DISPERSE: _____

_____

As the population increased more and more waste was dumped and the problem grew. The fibers that escaped from grinders and paper machines and pulp washers got into the streams and

collected on the gills of fish and fouling nets and lines with slime. Sometimes the waste permitted many natural organisms, e.g., bacteria, in the waters to thrive. The bacteria consumed the oxygen which left little for the fish li'e.

The fouling of streams with industrial waste and the sewage from towns and cities has combined with pulpmill waste and now has created such a problem, people have demanded that the waters be cleaned up.

What do we mean by water pollution? Even the crystal clear mountain stream contains small amounts of dissolved materials from the soil and rocks. Even rainwater contains gases and dust. You try to define water pollution.

By water pollution we mean that the water is carrying more foreign matter than can be allowed if that water is to be used for human consumption, recreation, growing fish or any other such purpose.

The process of cleaning up our streams and rivers has begun through the backing of The Clean Waters Restoration Act of 1966 which lays out a nationwide program to clean up existing pollution and prevent further pollution.

Think about ways you can aid in cleaning up our waters. Name some ways.

All the cleaning up will take some time, but with your help, it will get done sooner.

THE PAPER INDUSTRY IN THE U.S.*
FACT SHEET

Total number of plants in the United States (1967**)	5,890
States containing plants (1971)	49
Number of employees in paper industry (1971)	687,500
Wages and salaries paid (including fringe benefits.) (1971)	$6,916,000,000
Net Sales - Paper and Allied Products Companies (1971)	$22,224,000,000
Federal taxes paid (1971)	$456,000,000
State and local taxes paid (1971)	about $530,000,000
Capital spent for new plant and equipment 1947 to 1971	$20,080,000,000
Paper and paperboard produced (1971)	55,092,000 tons
Amount of paper used by each person in the United States (1971)	575 lbs.
Wood pulp produced (1971)	43,932,681 tons
Pulp produced from sources other than wood, (straw, rags, cotton fibre, hemp, bagasse and other grasses - 1971)	861,379 tons
Reused pulp fibres, i.e. waste paper (1971)	12,200,000 tons
Payments for pulpwood (1971 est.)	$1,300,000,000
Investment in research and development (1971) (McGraw-Hill)	$133,000,000

* Paper Industry includes: manufacturers of pulp, paper, paperboard and those who convert these materials inot useful products.

** Latest Published U.S. Census Bureau figures.

NOTE: 1971 data preliminary

November 1972

AMERICAN PAPER INSTITUTE
260 Madison Avenue
New York, New York 10016
Tel: (212) 889-6200

MANUFACTURING - FILMS OF THE PULP, PAPER AND PAPERBOARD INDUSTRY

A VISIT AT LONGVIEW FIBRE COMPANY - A descriptive pictorial of how pulp and paper is manufactured at Longview Fibre Company from the forest to the finished products.

Sound 16mm 22 mins. Color

Longview Fibre Company
Longview, Washington 98632

DAY AFTER DAY - A look at life in a small papermill town in Quebec where most the inhabit - ants derive thier livelihood from the one industry. Not only in the mill, but on the street, in the restaurant, in the home, the film reaches past exteriors to the very substance of company-town life.

Sound 16mm 28 mins. Black and white

The National Film Board of
680 Fifth Avenue
New York, New York 10019

THE COLOR MILL A tour of Peninsular Paper Company's operations from beginning to end.

Sound 16mm 18 mins. Color

Peninsular Paper Company
Ypsilanti, Michigan 48197

PRODUCT -

TIME OF CHANGE Concise story of hardboard, showing manufacturing and home construction applications.

Sound 16mm 13 ½ mins. Color

Georgia-Pacific Corporation
Public Relations Department
P.O. Box 311, Portland, Oregon 97207

PAPER AND I - People and paper products. Stresses the dependence of people on paper products and the fact that this demand can always be satisfied when all growers and users of forest products adopt wise practices.

Sound 16mm 13½ mins. Color and Black and white

Film Service Laboratories, Inc.
Jefferson Road
Athens, Georgia 30601

THE INCREDIBLE FOREST- This series covers various phases of the industry, including reforestation, logging, marketing, distribution, wildlife, etc.

Sound 16mm 28 mins.

MacMillan Bloedel Limited
1199 West Pender Street
Vancouver, Canada

SAFETY -

IT'S NOT THE AXE, IT'S JOE - Film shows re-enactment of accidents actually caused by careless use of the axe.

Sound 16mm 12 mins. Color

American Pulpwood Association
533 Forest Avenue
Portland, Maine 04101

PIERRE AND MARIE - Safety hand tools used in pulpwood cutting.

Sound 16mm 40 mins. Color

American Pulpwood Association
605 Third Avenue, New York, New York 10016

WIDOW MAKER - A realistic description of the dangers from falling snags during cutting operations.

Sound 16mm 20 mins. Color

American Pulpwood Association
605 Third Avenue
New York, New York 10016

EAR PROTECTION IN NOISE - Shows necessity of wearing ear plugs or muffs in noisy work areas.

Sound 16mm 12 mins. Color

Callier Hearing and Speech
Subcommittee on Noise
3819 Maple Avenue
Dallas, Texas 75200

ONE IS TOO MANY - Safety film showing details of Pacific Coast pulp and paper Industry labor management program, stresses safety from all levels—top management to worker.

Sound 16mm 28 mins. Color

Rarig Motion Picture Company
5514 University Way
Seattle, Washington 98105

WATER POLLUTION -

THE NEW RIVER - The film is designed around pollution problems specific to Kimberly-Clark and to seven particular areas in which it operates. It shows the use of a natural resource - water - and how it returns to the stream or river in a usable condition.

Sound 16mm 23 mins. Color

Kimberly-Clark Corporation
Public Relations Department
North Lake Street
Neenah, Wisconsin 54956

OYSTER DEVELOPMENT AND SURVIVAL - A scientific color motion picture showing development of oysters from microscopic cells to full size, including discussion of the effects of salinity, temperature, industrial waste and silt on oyster life.

Sound 16mm 26 mins. Color

Northwest Pulp and Paper Association
2633 Eastlake Avenue, E.
Seattle, Washington 98102

MISCELLANEOUS -

HOW TO READ NEWSPAPERS - Instructive for 6th, 7th and 8th grade students.

Sound 16mm 11 mins. Color

Coronet Films
65 E. So. Water
Chicago, Illinois 10001

THE BOOK - The many talents and techniques that are combined in printing a book.

Sound 16mm 18 mins. Black and white

Encyclopedia
Britannica Films, Inc.
Wilmette, Illinois 60091

PRINTING THROUGH THE AGES -

Early methods of reproducing pictures by means of carved wood blocks and the transition from printing pictures to printing letters.

Sound 16mm 13 mins. Black and white

Encyclopedia
Britannica Films, Inc.
Wilmette, Illinois 60091

PAPER MERCHANT U.S.A. -

A typical day in the operation of a paper distribution firm, illustrating its varied services to customers.

Sound 16mm 14 mins. Color

The National Paper Trade Association Inc.
220 East 42nd Street
New York, New York 10017

FILM STRIPS -

DATELINE TENNESSEE - Pictures in detail the operations of one of the largest and most modern paper mills in the U.S. at Calhoun, Tennessee.

No sound 35mm 76 mins. Color

Bowaters Southern Paper Company
Calhoun, Tennessee 37303

NATURE'S CHECKERBOARD - This film strip dramatizes in an elementary way the relation of man and animals to their forest environment and traces evolutionarey changes affecting both. It deals with the effects of man-made and natural changes-fire, insects, disease and the land needs of a growing population - on forest ecology, and puts them in a modern frame of reference.

No Sound 35mm 12½ mins. Color

Forest Industries
Information Committee
203 Beal Building
Duluth, Minnesota 55802

THE STORY OF WISCONSIN PAPER - This 54-slide film strip with captions and an accompanying guide-book for classroom use, covers general importance of paper in Wisconsin's economy and social life.

No Sound 35mm 13 mins. Color

Society for Visual Education
1345 W. Deversey Street
Chicago, Illinois 60614

CONVERTING -

50,000 WINDOWS - The spinning and dyeing of paper.

Sound 16mm 22 mins. Color

Bemis Bro. Bag Co.
604 South 4th Street
Minneapolis, Minnesota 55415

A NEW LOOK AT PEACH PACKAGING - Use of corrugated boxes for shipment of fresh peaches.

Sound 16mm 10 mins. Color

Fourdrinier Kraft Board Institute
99 Park Avenue
New York, New York 10016

STRESS AND STRAIN ON CORRUGATING MEDIUM - High speed film of medium behavior in corrugator operation.

Sound 16mm 45 mins. Black and white

The Institute of Paper Chemistry
Appleton, Wisconsin 54910

BEHAVIOR OF MEDIUM IN SINGLE FACER - High speed film of corrugating operation.

Sound 16mm 15 mins. Black and white

The Institute of Paper Chemistry
Appleton, Wisconsin 54910

PAPER IN THE ROUND - Demonstrates and explains how paper can be folded, cut or bent, and decorated to create many forms and shadows. An ideal film to motivate and demonstrate work in paper sculpture.

Scund 16mm 11 mins. Color and black and white

McGraw Hill Book Co., Inc.
330 West 42nd Street
New York, New York 10036

FORESTRY--

TREES FOREVER - Tree farm management with particular emphasis on the new equipment now being utilized.

Sound 16mm 22 mins. Color

Crown Zellerbach Corporation
One Bush Street
San Francisco, California 94119

AIRCRAFT IN FOREST FIRE CONTROL - Shows aircraft used in controlling fires, airlifting men and equipment, fighting a holding action while ground crews move to the scene, playing vital role in the protection of valuable timber stands.

Sound 16mm 29½ mins. Color

Department of Forestry and Rural Development
759 Sir Guy Carleton Building
161 Laurier St. W.
Ottawa, Ont., Canada

BIRTH OF A SOUTHERN PINE - Natural reseeding. Shows how seedings are produced from fertilization of female flower, collection of mature cones, extraction of seed at state nursery, and first year in seed beds, to bundling of seedlings for shipment.

Sound 16mm 15 mins. Color

Film Service Laboratories
Jefferson Road
Athens, Georgia 30601

WHEN A FELLOW NEEDS A FORESTER -

Forest management. Shows the change in thinking of a small woodland owner regarding services offered by a forester after seeing the work demonstrated on his own land. Demonstrates forest management practices necessary to assure full tree growth on every forest acre.

Sound 16mm 23 mins. Color

Film Service Laboratories
Jefferson Road
Athens, Georgia 30601

THE FOREST - MAGIC WORLD OF WOOD -

The complete cycle of forest to quality products, and the efficient use and repairing of trees.

Sound 16mm 20 mins. Color

Georgia Pacific Corporation
Public Relations Department
P.O. Box 311
Portland, Oregon 97207

PACIFIC PLANTATIONS -

Describes modern forestry management techniques, such as sustained yield, multiple use of forest lands, maximum use of the log and important part of wood will play in the economy of the future.

Sound 16mm 20 mins. Color

Georgia Pacific Corporation
Public Relations Department
P.O. Box 311
Portland, Oregon 97207

MEET YOUR NEIGHBOR
GREAT NORTHERN -

The film portrays various phases of paper manufacturing from the forest to the finished product. It points out the importance of paper in our daily living and the need for a well managed multiple use forest land as a continous source of raw material.

Sound 16mm 30 mins. Color

Great Northern Paper Company
522 Fifth Avenue
New York, New York 10036

WOODLAND HARVEST -

This film portrays operations carried ou the in Northern Central United States and Canada. Although devoted primarily to the harvesting of pulpwood logs, emphasis is placed on the interest and role of the forester in insuring the continuation of the wood lands for future generations by proper cutting methods and reforestation. One of the picturesque highlights of the film is the transporting of the logs by river driving.

Sound 16mm 14 mins. Color

Kimberly-Clark Corporation
North Lake Street
Neenah, Wisconsin 54956

THE PERPETUAL HARVEST-

This film covers British Columbia's forest industry. It illustrates the harvesting of the province's timber crop, follows the logs through the converting plant where they are manufactured into hundreds of useful articles. It demonstrates that the forest of British Columbia, while producing vast quantities of these products, are constantly being restored to produce again for future generations.

Sound 16mm 28 mins. Color

MacMillan Bloedel Limited
1100 West Pender

THE PAPER FOREST - This film describes the forest development of a 12-state area in the South which encompasses the largest forest area in America. It traces the conversion of pulpwood into paper, the economic importance of the pulp and paper industry and its relation to the South's forest resource.

Sound 16mm 28½ mins. Color

Modern Talking Picture Service
1212 Avenue of the America
New York, New York 10036

TOMORROW'S TREES - A dramatic presentation of tree farming in the Pacific Northwest. Shows logging, helicopter seeding, seeding growth, animals, forest recreation and research forestry.

Sound 16mm 28½ mins. Color

Modern Talking Picture Service
1212 Avenue of the America
New York, New York 10036

TRASURES OF THE FOREST- Presents the processing of timber, from scientific management and industrialharvesting, to the finished newsprint and other paper and wood products. The film demonstrates the increasing machinery to-man ratio , the increasingly efficient utilization of wood and the specialized industry of salvaging waste.

Sound 16mm 13½ mins. Black and white

National Film Board of Canada
680 Fifth Avenue
New York, New York 10019

SAWTIMBER - The primary role of the forests of the Intermountain West in the production of wood for manufacture into useful products, showing some of the complexities of management in achieving a balanced forest--planning, people, money, equipment, time, is the subject of this film.

Sound 16mm 23 mins. Color

National Film Board of Canada
680 Fifth Avenue
New York, New ork 10019

LOGGING -

THE AWAKENING GIANT - Recruiting pulpwood loggers. Depicts the importance of pulpwood in our lives and the opportunities for young men in the modern pulpwood industry.

Sound 16mm 15 mins. Color

American Pulpwood Association
533 Forest Avenue
Portland, Maine 04101

LOGGING SYSTEMS AND MACHINE CONCEPTS - Divided into three sections, one portraying improved methods of handling short wood, amother portraying improved long wood systems, and the last showing full tree logging.

No Sound 16mm 40 mins. Color

American Pulpwood Association
605 Third Avenue
New York, New York 10016

MODERN SKIDDING - Film portrays safe practices in skidder operations in Canadian forests.

Sound 16mm 15 mins. Color

American Pulpwood Association
605 Third Avenue
New York, New York 10016

WINTER HAULING IN THE NORTHEAST - Depicts safety and training in winter hauling of pulpwood in the Northeastern United States.

Sound 16mm 24 mins. Color

American Pulpwood Association
533 Forest Avenue
Portland, Maine 04101

LOG DRIVE - Annual log drive from the spruce forests of Quebec, Canada.

Sound 16mm 30 mins. Black and white

National Film Board of Canada
680 Fifth Avenue
New York, New York 10019

MANOUANE RIVER LUMBERJACKS - This film is about the men who labor in the extremes of a Canadian winter to harvest the logs for the mills. A rugged film of a rugged life, it takes you to the very heart of a major Canadian industry.

Sound 16mm 27½ mins. Black and white

National Film Board of Canada
680 Fifth Avenue

MANUFACTURING -

AN AMERICAN SAWMILL - This film relates the story of a typical American sawmill and reveals the variety of skills required in the fundamental process of converting a tree into products for man's use.

Sound 16mm 22 mins. Color

Audio-Visual Center
University of Idaho
Moscow, Idaho 83843

PAPER AND PULP MAKING- Paper and pulp making processes from raw materials to finished product and importance of paper industry to daily living.

Sound 16mm 11 mins. Color

Coronet Films
65 E. So. Water Street
Chicago, Illinois 10001

THE POWER OF PAPER - A panorama of papermaking from ancient times showing modern tree farming, pulp and paper manufacturing, and distribution.

Sound 16mm. 27 mins. Color

P.H. Glatfelter Co.
Spring Grove, Pennsylvania 17362

GREAT WHITE TRACKWAY- Manufacture of fine writing and business paper.

Sound 16mm 27½ mins. Color

Hammermill Paper Co.
Erie, Pennsylvania 16512

PAPER: PACEMAKER OF PROGRESS - A brief history of the manufacture of paper from early hand operation to the modern machines of today.

Sound 16mm 27½ mins. Color

Huyck Felt, Co.
Remsselaer, New York 12144

PAPER'S MAGIC CARPET- A brief story on the operations involved in the manufacture of papermaker's felts at the world's largest modern felt making plant in Aliceville, Alabama.

Sound 16mm 30 mins. Color

Huyck Felt Co.
Rensselaer, New York 12144

PAPERMAKING IN CHINA - This film turns back the clock thousands of years in the papermaking process. Film depicts the processing of paper in China, by hand, many years ago, and practically the same as done during the Ming Dynasty.

Sound 16mm 14 mins. Color

Jones Division, Beloit Corporation
Pittsfield, Massachusetts 02103

OCEANOGRAPHY UNIT

Prepared by: Paul Miller and David Beisel

Date: April 1, 1973

School Address Contoocook Valley Regional High School,

Peterborough, New Hampshire.

Grant # OEG-0-70-519 (361)

Project # V061052

Project World of Work

Charles Pieterse, Project Director

OCEANOGRAPHY

This unit will stress marine biology with ecology as the focal point with student experiences centering on population of plant and animals and the biotic, chemical, and physical factors that affect them.

The activities you carry on in the field or lab will be "hands on" experiences, all of which marine biologists normally carry on in the course of their jobs. By carrying on these experiences you will "see" first hand what a marine biologist does.

GENERAL BEHAVIOR OBJECTIVES

Given the necessary equipment, materials or resources, each student will:

1. demonstrate proper laboratory techniques by cleaning all apparatus after use.
2. demonstrate proper laboratory techniques by putting all apparatus and materials away in their proper place.
3. write notes in a prescribed form during demonstrations of equipment uses or methods or procedures.
4. take notes in a field notebook of observations made while on field trips.
5. answer the specific questions on the study sheets for film strip open labs, video tapes, and movie films.

BULLETIN BOARD
DESCRIBING OCCUPATIONS IN OCEANOGRAPHY

Directions-Each student must pair with another student to do this activity. During the course of nine weeks each pair of students is to set up a bulletin board display describing one or more occupations in the field of oceanography. The display will remain for one week and then be removed by the same students in preparation for the next display.

Some suggestions for display are given. These are just a few of the many thousands which maybe done.

Fisheries
Chemistry
Physics
Meteoralogy
Food Industry
Ecology
Biology
Techinicians
Devices and Equipment
Photography
Tourism
National Defense
Scuba Diving
Salvage
Hobby
Oil
Minerals
Desalinization
Transportation
Chart Making
Construction
Ship Building
Engineering
Exploration
Research
Surveys
Law Enforcement
License Bureau
Film Making
Teaching
Aquaria
Geology
Paleontology
Mathematics
Pollution
Estuaries
Wild Life Management
Power Plants

Helpers:

Your own personal experiences
People you know in the field
Magazines
Papers
Books
Library
Resource Centers
Guidance Dept. (occupational opportunity file.)
Vertical file in IMC

OPEN LAB
STUDYING AN OCCUPATION

Directions: What would you be interested in doing in the field of oceanography? When you have decided, look ahead at the Form for Studying an Occupation. You are required to fill in the form as complete as you can. The information can be had by inquiring at the Science Resource Center where resources have been set aside for you. DO NOT WRITE ON THIS FORM-Forms for your use may be obtained at the Science Resource Center.

FORM B

SUGGESTED FORM FOR STUDYING AN OCCUPATION

Name _____

Date _____

Complete the blanks or underline either yes or no.

I. Classification of the Job

A. General _____

B. Specific branch _____

C. Name of particular job _____

II. Description of the work on the job (List a minimum of five duties)

A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

G. _____

H. _____

I. _____

II. Education or Training Needed for the Job

aA. What skills do you need?

1. _____

2. _____

B. What courses in high school would help to prepare you for this job?

_____

_____

C. Where con you get the training needed for this job?

1. _____

2. _____

3. _____

IV

IV. Personality Traits, Interests Aptitudes, etc. Needed for the Job

A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

G. _____

H. _____

V. Demand for Workers in This Job

A. Are additional worker's needed now in this occupation? Yes or No

B. Will still more workers be needed in the future? Yes or No

C. Is it considered a bright future, status quo or dead end job(Underline)?

VI. Promotion

A. Are there opportunities for promotion?

B. What appear to be the steps of promotion?

1. _____

2. _____

3. _____

4. _____

C. Must one get additional training to qualify for promotion? Yes or No

1. Formal Yes or No

2. Informal Yes or No

3. Apprentice Training Yes or No

D. Are there related occupations to which this job may lead either with or without more training? Yes or No

What are some of these? _____ _____

_____ _____

VII. Earnings

A. Beginning wage (underline per hour, per day, or per week) $ _____

B. Wage earned by most of the workers $ _____

C. Highest wage $ _____

D. Is there usually a vacation with pay? Yes or No

E. (Other benefits) _____

_____

VIII. Hours of Work

A. How many hours on the average would one work in this job?

1. Daily _____

2. Weekly _____

B. Is there additional pay for overtime work? Yes or No

C. Are there seasonal lay offs? Yes or No

IX. Health and Safety

A. Are there health dangers involved? Yes or No

If so, what kinds? _____

_____

B. Is there a high accident rate on this job? Yes or No

C. What safety precautions must be taken?

1. Wear protective clothing? Yes or No

2. Check guards on the machines and equipment? Yes or No

3. Obey safety rules of the firm? Yes or No

X. Employee Organizations of a Full-Time Worker

A. Would you be expected to join a union? Yes or No

B. Would you be expected to join an employee organization other than a union? Yes or No

XI. Service to the Community (How do workers in this job serve the community?)

A. _____

B. _____

C. _____

D. _____

XII. Firms in our Town or County where this Type of Job would be Available (List a minimum of three)

A. _____

B. _____

C. _____

D. _____

XIII. Sources of Information Used to Make This Study (List a minimum of three)

A. Title _____

Publisher _____

Date Published _____

B. Title _____

Publisher _____

Date Published _____

C. Title _____

Publisher _____

Date Published _____

D. Additional Means

1. _____

2. _____

XIV. How does this job interest you?

Appealing _____ Disappointing _____ No interest _____

Why? _____

_____

MARINE ECOLOGY
INTRODUCTION

When man learns that he, too, is a part of the scheme of things in the ocean, and not the absolute ruler of it all, irresponsible of all except himself, wasteful and greedy, then and only then will he be able to live with the wonders of nature instead of destroying them. For in destroying the natural world in which he lives he will destroy himself. Perhaps this is a part of the scheme. Certainly, the other animals would benefit without man! Imagine if man were gone from the earth. The natural order of things would return: Rivers would again become clean, animals would return in balanced numbers, the air would become clean and pure, fish would return to rivers and lakes, water tables would be reestablished, the hawk would fly unmolested, sounds of machines would be replaced by the whisper of wind and trills of birds, the onshore breeze would be salty and fresh and the beaches would again be clean of rubbish and litter.

In some places on earth, where man is a stranger, nature flourishes. Could man learn to live within nature rather than consider himself an outsider? But, if the story of the earth is true, as it now seems, man will have his day, then die and the story will go on-but, who will listen then?

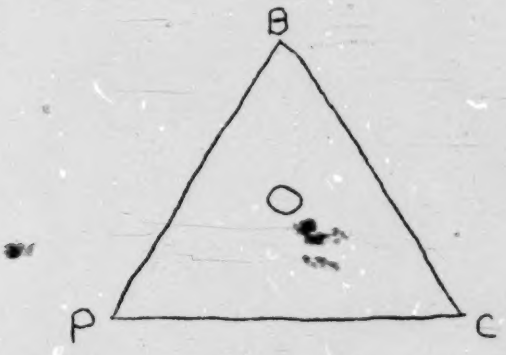
So, in this course, we hope we may find listeners. How do you, as a listener fit into this picture? If you will endeavor to answer the following questions as you study marine ecology you will discover your niche.

1. Who is it?
2. Who else is there?
3. Were all these organisms always there?
4. Where do you suppose they came from originally?
5. How do they live, eat and reproduce?
6. Do these organisms compete with each other?
7. Why are they here and not somewhere else?
8. What enviromental factors affect them?
9. Is this a good place for them?
10. What might happen if any of the "good" conditions are changed?
11. Will they always be here?

LECTURE #1

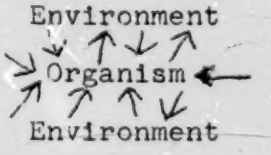
The Big Picture

1. The environment and the organism are directly related to each other. There is a constant interplay of action and reaction going on. Visualize the organism you are studying in respect to its environment like this:



Where: o is the organism
Δ the entire environment
C chemical factors
P physical factors
B biotic factors

Or like this:



LECTURE #1

Behavioral Objectives

Having listened and taken notes on The Big Picture the student will be able to:

1. Explain what "environment" means.
2. Tell what is meant by physical, biotic and chemical factors.
3. Show, using specific examples, the interplay between the organism and the environment.
4. Sketch and show graphically the relationship of the organism to its environment.

FIELD TRIPS

"Get Ready"

During this course, you will have the opportunity on two field trips, to observe different kinds of plants and animals found in various tide pools of a rocky shore at North Hampton beach. You will be studying factors that may affect the very survival of plants and animals. Some of these factors you will be testing are oxygen content, pH, salinity, and temperature of water. You will also observe whether or not wave action; exposure to temperture, wind and tides, affect organisms as well as special survival adaptive features that organisms may exhibit. You may also be able to see other relationships such as symbiosis and food webs.

In order that you are able to make sense about life at a rocky shore you must be able to identify plants and animals found there as well as some things about how they fit into the total picture.

What To Do

1. Learn the common names of the plants and animals designated in the museum collection as living in a rocky shore area.

2. Select an animal (from the lab) and complete an outline which includes its:

   a.) common name
   b.) habitat
   c.) niche
   d.) reasons for its being there
   e.) special survival adoptations such as hold fasts, holding fast, movement during tide action, way of getting food, streamlining, and protective features.
   f.) relationships to other plants, animals and man.

3. Select a plant from the lab and complete an outline which includes its:

   a.) common name
   b.) habitat
   c.) niche
   d.) reasons for being there
   e.) relationships to animals and plants
   f.) relationships to man

Your outlines will be due_____just prior to your first field trip.

A revised outline will be due on_____after the trip.

Your outline will be duplicated and distributed to the other members of the class.

Helpers:

Be sure to use the two resources set aside in the Science Resource Center for oceanography.

A spot quiz will be given on the identification of the museum organisms at the end of the first week.

VIDEO TAPE-"SURVIVAL IN THE SEA"-30 MINUTES

1.) List at least three things that an animal species must be able to do in order to survive in the sea.

2.) List six specific kinds of animals and explain how each is "built" to survive in the sea.

3.) A fish may lay 1,000,000 eggs in a year. What are the chances of any of them developing into adults? Why?

4.) What is meant by "survival of the fittest"?

5.) Where does the food chain start in the sea?

Describe the entire chain starting at this point and ending with man.

6.) If a link in the chain were destroyed, what would happen to that chain?

FRIEND OR ENEMY

From the beginning, every living thing must struggle for its existance. In this struggle, some plants and animals form relationships with one another. This is called SYMBIOSIS.

MUTUALISM is a form of symbiosis in which both organisms benefit from each other. For example, lichen growing on rocks (see the example on the front lab. desk) is two plants, an algae and a fungus. The green algae makes food for the fungus to use. The fungus, like a sponge, takes up water that the algae uses.

COMMENSALISM, another form of symbiosis occurs when one partner benefits only. The other partner is neither harmed nor helped. For instance, porcupines feeding on hemlock trees during the winter drops bits of tender branch tips as they feed. The browsing deer on the ground benefits from this ready food supply.

PARASITISM is a third type of symbiosis in which one organism attaches itself to another. The attached organism feeding on the last organism causes damage to the last. The fungus, athlets foot, causes damage as it feeds on the skin of your feet.

WHAT TO DO

1.) On your first field trip to North Hampton record in your field notebook two examples of COMMENSALISM and MUTUALISM. You will probably want to use resource books in the Science Resource Center for background information before you go.

2.) Do the lab on fish dissection and record on your lab sheet all of

the examples of parasitism on the external and internal parts of the fish. External features, such as, gills, fins, and scales often times contain paraistes. Internal features, such as, in the liver and intestines and the body cavity. Explain how the fish parasites affect the animal.

FRIEND OR ENEMY
BEHAVIORAL OBJECTIVES

Given the neccessary equipment, materials and resources, the student will be able to:

1. Define: Symbiosis, Commensalism, Mutualism,,and Parasitism.
2. Give one example and explain the relationship for each of the terms in number one above.
3. Show his instructor that he has completed the dissection of a fish lab, and show all other notes and data he has recorded.

Name_____
Instructor_____

OPEN LAB #1

Filmstrip-Life in the Oceans

Directions-Obtain the above filmstrip and a viewer. As you view the filmstrip answer the following questions.

1. List five major problems that organisms living in the tidal zone must be able to overcome.

2. List three factors which make the tidal zone a good place to live in.

3. Give at least three good reasons why more living things are found in the ocean than on land.

4. Why do you think all life, both land and sea, depends on the presence of sunlight.

5. In what three areas of the sea are most creatures found? Why?

6. Draw sketches of several forms of diatoms found in the ocean.

7. Of what importance are diatoms?

9. Give a short definition of "Plankton."

9. Can animal plankton live without plant plankton? Explain.

10. What is meant by "Food Chain"? Draw or describe one.

11. Refer to frame #21. Complete the following "Food Pyramid" by placing the organisms on the frame at the proper level.

12. Why is it possible for many bony fish to live at the bottom of the ocean even though there is little or no light available?

13. Give five ways in which fish are adapted to living in the open sea.

OPEN LAB #11

Filmstrip-"Tidal Pool Zoo"

1. Give three reasons why the living population in the tidal zone is more dense than in any other zone of the sea.

2. What two physical factors must a living thing like a mussel be able to withstand in a tide pool area?

3. The six zones of the New England tide pool area are composed of living things. What determines what lives there?

4. What kind of tide pool algae is the hardiest? Why?

5. Why would you not expect to find a common periwinkle living with a rough periwinkle?

6. How are periwinkles well adopted for food getting?

7. In what three ways is a barnacle well adopted to its environment?

8. In what three ways does rockweed seaweed found at the ocean edge benefit other forms of life?

9. Why are plants like rockweed and irish moss not found on a sandy shore?

Name_____
Instructor_____

OPEN LAB #111

Filmstrip: "Mighty Currents of the Sea"

Directions: Ask for the above filmstrip and a viewer. Then proceed to answer the questions below.

1. List four forces which cause ocean currents.

2. Explain how each of the four forces causes a current to occur.

3. Give two ways in which the sun is responsible for some of the ocean currents.

4. Explain what is meant by the Gulf Stream. Explain the theory of how it works.

Extra Credit-You may OR may not do the following.

1. Explain in concise outline form the New Theory of the Ice Ages.

Name_____

Instructor_____

OPEN LAB #4

FILMSTRIP: "CREATURES OF THE SEA"

DIRECTIONS:

Ask for the above filmstrip and a viewer. Then follow the directions given below.

List 27 ways in which the sea creatures in this filmstrip have adapted themselves to survive. Write the name of the creature which illustrates the adaption.

	ADAPTATION	NAME OF THE CREATURE
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		

ADAPTATION NAME OF THE CREATURE

18. _____

19. _____

20. _____

21. _____

22. _____

23. _____

24. _____

25. _____

26. _____

27. _____

OPEN LAB #5

FILMSTRIP: EXPLORING THE SEA:

"METHODS OF THE OCEANOGRAPHER"

DIRECTIONS:

OBTAIN THE ABOVE FILMSTRIP AND A VIEWER. ANSWER THE QUESTIONS AS DIRECTED BELOW.

1. List five things which are considered in the science of oceanography.

2. What is meant by "State of Flux"?

3. Give at least 4 ways man has been able to explore deep oceans?

4. How can an oceanographer tell the depth of water?

5. What is meant by "Core Sample?"

6. Give at least 5 other devices the oceanographer would use in studying the sea.

"PRESERVING SEA SPECIMENS LAB."

On your field trip to North Hampton beach one of your responsibilities will be to collect and preserve_____

One starfish
sea urchin
sand shrimp
periwinkle
limpet
seaweed (algae) exhibiting a symbiotic relationship.

Algae preservative FAA:

Prepare 100 ml of solution by this formula_____

5ml glacial acetic acid
5ml formalin
90 ml 50 percent ethyl alcoho
Add a pinch of copper sulfate to the solution. This insures that plants will keep their green color.
Put this solution in a large clean baby jar and label it POISON, FAA AND YOUR NAME

MOST ANIMALS PRESERVATIVE

Prepare a 100ml of a 10 percent formalin solution by the following formula

10ml commercial formalin
90ml sea water
Put this solution in a large clean baby food jar and label it POISON, FORMALIN AND YOUR NAME
Store these solutions in a lab cabinet for the field trip.

BEHAVORIAL OBJECTIVES

Given the necessary equipment, materials or resources, each student will

1. Prepare 100ml of FAA plant preservative by following the proper lab procedure.

2. Prepare 100ml of a 10 percent formalin solution preservative by the proper lab procedure.

3. Label this solution POISON and the appropiate preservative name and your name.

4. Store the solution in a lab cabinet for the field trip.

FIELD TRIPS

On any field trip, particularly one to a rocky shore area, for things are very important: 1. Come prepared to do the job, teat is, be sure you understand what you are expected to do and have all of the necessary equipment and materials to do that job. 2. Travel the area with caution as sea rocks especially those with seaweed are dangerously slippery. 3. Come properly dressed to do the job with proper foot gear and clothing. 4. Have you field notebook and pen with you at all times. Notes are important for putting together later as a report. It is important that you follow these four points as you go about your field work.

Behavioral Objectives for Field Trips

Given the necessary equipment, materials, or resources, the student will:

1. Demonstrate the four key points of a field trip by: Coming prepared, traveling the area with caution, coming properly dressed, and by having a field notebook and pen.

You Will Need

First Aid Kit
Plasic collecting bucket
Baby food jar of 10% formalin preservative
Baby food jar of FAA preservative
Field notebook
Thermometer
Stainless steel knife (nonrusting)
Hand lens

"NORTH HAMPTON BEACH FIELD TRIP I"

The purpose of this trip is to ferilarize you with a rocky shore area and have you make some observations, and collect some data as well as specimens.

What To Do by teams of two.

1.) Collect live ten medium sized sea urchins towards the later part of the day and place them in the cooler with cold sea water.

2.) Observe a small crab, limpet, periwinkle, sponge, star fish, sand shrimp, and a sea urchin taking care to make notations concerning adaptive features which enables these creatures to survive in this often times perilous environment and its specific habitat.

3.) Collect these organisms and preserve them for later lab study.

4.) Collect one plant that exhibits a symbiotic relationship and preserve it for discussion and display in the lab. Describe this form of symbiosis in your field notebook.

5.) Select a prominent "seaweed" rock at the waters edge and very carefully scrape away all life in a 4" X 12" section. Mark your rock with nail polish and record the rocks location with a sketch in your field notebook. You will be observing this strip on your second field trip.

6.) Select five zone pools more or less in a straight line starting at the waters edge and ending at a pool near the blue/green algae zone. Sketch the pool locations using landmarks as reference points. You could also pace between pools. Now complete the "Substrate and Biota" chart as you study your pools.

7.) In your field notebook record observations concerning organisms special adaptive features connected with desiccation (drying out) sunburn, temperature variations, tide force or other features your note.

8.) Upon returning to the lab., write a brief report explaining what you did, the data you collected, variations from pool to pool, adaptive features of organisms (plants and animals), and possible reasons for differences in the types of life found in the different pools.

9.) Extra Credit-one person can use the plankton net as demonstrated by your instructor to collect a jar of organisms which can be transfered to the lab. for further study.

Questions

What suggestions would you have for another field trip like this one?

FIELD TRIP #1. SUBSTRATE/BIOTA AT NORTH BEACH

PHYSICAL FACTORS				HIOTIC FACTORS			
ZONES	NATURE OF SUBSTRATE	TEMP. F° water / air	POOL SIZE	DOMINANT ORGANISMS	#/FT2	OTHER ORGANISMS	#/FT 2

Behavioral Objectives

Given the necessary equipment, materials, or resources, each student will:

1.) Collect and store ten medium sized sea urchins.
2.) Observe and note in writing adoptive features of a starfish, sea urchins, sponge, sand shrimp, crab, limpet, and a periwinkle which enables them to survive.
3.) Collect and properly preserve the above mentioned organisms.
4.) Collect and preserve one plant that exhibits a symbiotic relationship.
5.) Describe in his field notebook this form of plant symbiosis.
6.) Scrape a "4 X 12" section from a seaweed rock, noting its location for future reference inyour notebook.
7.) Sketch the five zone pool locations you selected for study.
8.) Record in his notebook observations concerning organisms special adoptive features connected with desication, sunburn, temperature variations, tide force and others.
9.) Write a brief report explaining what you did, your data, pool variations, organism adoptive features and possible reasons for differences in life observed in the different pools.

LAB #I

Fertilization Experiment Using the Sea Urchin

I. Information about sea urchins you will need to know before starting this experiment.

1. Know what a sea urchin looks like.
2. Know where to find them.
3. The sexes are difficult to distinguish, therefore collect at least ten. There is usually one male for every female.
4. Avoid damage to the delicate epidermis (outer skin) and the tube feet. Injury here may cause the death of the animal in one day.
5. Specimins are "Ripe" (fertile) from Feb-July with March being the best collecting month.
6. Healthy urchins will survive for weeks in simple aquaria, provided the following is done:

   A. Keep them cool, 13-15° c is best.
   B. Do not overcrowd your tank.
   C. Prevent evaporation-This will prevent concentration of salts.
   D. Make sure all devices used in the tanks are rush proof or plastic-Use no metal.
   E. Tanks must be aerated and filtered through charcoal.
   F. Add a <u>few</u> mussels. They are natural filters.
   G. Food-uncooked meat, fish or seaweed.
   H. Remove <u>all</u> uneaten food to avoid decay and fouling of the tank.

II. Obtaining sperms and eggs from your specimens.

NOTE: The following method does not kill the animal.

I. Inject 0.5 molar solution of KCL (potassium chloride) through the peristomial membrane (refer to Barnes, Pg. 630, Fig. A, Invertibrate Zoalogy, 1968) Use a fine hypodermic needle. Use the following amounts for various sized animals.

2 inch diameter .5-1ml
3 inch plus up to 10ml

2. Spawning usually begins immediately but may take us long as several minutes after injection of KCL salution. Males shed a white sperm while the female eggs are reddish in color.

3. Collect eggs by inverting the injected female over a beaker filled with sea water so that the gonopores (refer to Barnes as above) are immersed.

4. Collect sperm directly from the aboral (upper) surface with a pipette. The sperm should be diluted with sea water before allowing fertilization (sperm meeting eggs). One ml of sperm per 20 ml of sea water is a good dilrition for fertilization.

5. Observe sperms and eggs separately with compound microscope. Draw a diagram of each.

III. Fertilization

1. Fill a well slide with eggs and observe them under good focus.

2. Add a small drop of the sperm solution and observe immediately through the microscope. Within seconds of mixing sperm and eggs, a male sperm will penetrate eggs and you will see a fertilization membrane forming.

3. If you have time, put the slide in a safe place at room temperature. Observe it 50 minutes later for 10-15 minutes. You may see the fertilized egg cell divide to form two new cells.

Question-Explain how fertilization of the urchin is likely to occur in the ocean. What adoptations does the animal have to assure that this reproduction will occur?

"Plankton Lab"

Plankton or drifters of the sea are microscopic forms of plant or animal life. Although these forms of life are extremely small there role in the "scheme of things" of the sea is extremely important. Microscopic floating plants, phytoplankton are mostly diatoms whose role is two fold. (I) Diatoms as green plants produce their own food and oxygen. (2) Diatoms become food for microscopic animals called zooplankton.

Studies have been made with plankton and some interesting things have been pointed out. Diatom populations as high as 72,000,000 per cubic foot of water has been recorded. There can be as many as 120,000,000,000 zooplankton in a square mile of water off shore. A single zooplankton can have in its stomach at one time more than 120,000 diatoms. A small fish feeding just off shore might be able to collect 50,000 zooplankton in short order.

What To Do

1.) Take a dropper of "plankton" sea water and add two drops to a concave slide.

2.) Add a cover slip and view the slide under low power using the monocular microscope.

3.) Describe in writing the kinds of life you see.

4.) Identify the different types of phytoplankton and zooplankton.

5.) Make one detailed drawing of the most numerous type of phytoplankton and label it.

6.) Make one detailed drawing of the most numerous type of zooplankton and label it.

Helpers: Refer to the plankton identification plates in the lab.

Question

How else do diatoms benefit man?

Behavioral Objectives

Given the necessary equipment, materials, or resources, each student will:

1. Demonstrate the proper lab procedure for preparing and viewing a slide of plankton for a monocular microscope.

2. Describe in writing the kinds of plankton viewed with the microscope.

3. Identify the different kinds of phyto and zooplankton viewed.

4. Draw in detail the most numerous type of phytoplankton viewed and label it.

5. Draw in detail the most numerous type of zooplankton viewed and label it.

6. Explain other ways in which diatoms benefit man.

LAB #I

Behavioral Objectives

Given the neccessary materials and equipment the student will be able to:

1. Describe a sea urchin.
2. Tell where a sea urchin can be found.
3. Tell how to properly handle a sea urchin to prevent injury to the animal.
4. Explain the specifications neccessary to maintain maine aquaria for a period of at least two weeks.
5. Show the location of the peristomal membrane and gonophores on a sea urchin.
6. Fill and discharge safely a hypodermic syringe.
7. Properly dilute sperm with sea water.
8. Describe the appearance of urchin eggs and sperms as viewed under the microscope.
9. Describe the appearance of eggs and sperm as they unite under the microscope.
10. Explain how the process is likely to take place in the natural environment.
11. Give at least two adoptations which the sea urchin possesses to insure fertilization in the ocean.
12. Show his notes, data, drawings and answered questions on this lab. to his instructor.

Name _____
Instructor _____

Dissection of the Sponge

Purpose: To observe the structure of a common sea sponge and determine how it is adapted for life in the ocean.

Directions: Follow the procedure given below and answer the questions. You may find the book Modern Biology helpful in doing this and other labs.

1. Obtain a sponge (Grantia sponge is most often available and a good one to use because of its small size.)

2. Using a stereo dissecting scope, make a drawing of your specimen in the space provided below. Describe its appearance.

3. Notice the openings in the surface. Carefully insert a dissecting needle in one of the openings. Does it pass through the body wall?

_____

4. Indicate the direction of water flow by putting arrows on your drawing. (Do you have your sponge drawn right-side up?)

5. Would it be possible that the water could flow in a direction opposite to that which you have indicated? _____

6. Support your answer. _____

_____

7. What experiment could you perform to demonstrate current direction in a living sponge? _____

8. Insert the point of your scissors in the osculum of your specimen and cut it lengthwise. Note the hollow central cavity. Although you won't be able to see the flagella lining the canals of your specimen, the diagram below show their arrangement.

9. What is the function of the flagella? _____

10. How so you suppose your sponge obtained its food and oxygen? _____

_____

11. On the diagram at the right label the following parts: spicules, incurrent pores, osculum, canals,

central cavity, flagella.

12. What is the function of spicules?

13. On a microscope slide, mash a section of your sponge. Apply a cover slip. Under low power of your microscope, look for the spicules. If you are having trouble seeing them, add a drop of Clorox bleach.

14. Draw several of the spicules you see.

15. Is the sponge a plant or animal? Explain.

16. Give two ways in which the sponge is adapted to sea life.

Dissection of the Sponge

Behavioral Objectives

Given the neccessary materials and equipment, the student will be able to:

1. Show his data, drawings and answers to questions to his instructor.
2. Describe the physical appearance of a typical sponge.
3. Describe the openings found in a sponge and how water flows though the sponge.
4. Explain an experiment which would show how water flows through a sponge.
5. Define: Flagella, canals, spicules, incurrent pores, osculum, central cavity.
6. Explain the function of flagella in a living sponge.
7. Describe the technique for exposing spicules for clear observation.
8. Tell whether a sponge is a plant or animal and support his answer.
9. Give two adaptations of the sponge to sea life.

Dissection of the Fish

Purpose: To show how a fish is adapted to service. The textbook Modern Biology will be helpful.

Procedure:

I. 1. Place the fish in a dissecting pan with its head to your left. Raise the operculum and examine the gills and look into the mouth cavity to see where it enters. Explain how the water circulates in, around and out of the gills.

2. Cut the operculum away with your scissors and remove one of the gills by cutting the upper and lower attachments of the arch. Rinse off the gill and examine it closely.

3. For better examination, place the gill under the stereo dissecting scope. Examine the feathery filaments and the comb like rakers.

4. Look closely at the upper and lower ends of the arch and see if you can find the blood vessels which enters and leave the gill.

5. What is the purpose of the gill?_____

6. Explain how it is specially constructed for this purpose.

_____

_____

7. Draw a sketch of the gill and label: Gill, arch, filaments, rakers.

II. 1. Learn the names of the surfaces of an animals body as given below.

Dorsal-top	Anterior-front
Ventral-belly	Pasterior-tail
Lateral-side	

2. Hold the fish ventral side up and the head pointing away from you. Insert the point of your scissors through the body wall in front of the anal opening and cut up the mid-line of the body to the space between the operculums on the lower side of the head.

3. Lay the fish on its right side (with the head on your left) in the dissecting pan. Continue the incision from the chin around the back edge of the gill chamber, to the top of the body cavity. Be careful not to distrub the organs underneath. With your sharp scalpel, make the remaining incision at the top of the body cavity and remove the side of the body wall. You have now exposed the body organs in their normal positions.

4. Locate the esophogus and the stomach.

5. Insert your finger into the mouth and rub the small teeth in both directions.

6. From what you observe, how is a fish able to capture, hold, and consume its prey?
(This may be another fish half its own size.)

7. If your specimen is a female, you may notice a large number of undeveloped eggs.

8. Locate the swim bladder. What do you think its function might be? Why is it necessary?

9. Notice the general shape of your fish from nose to tail. How does this shape help the fish?

10. Having observed the muscle area and th fins of your fish, which do you think is responsible for speed?_____ For direction?_____ Why?_____

11. Look on top of the fishes nose. Locate the nostrils. Their function is for smell only. Account for their location.

12. Turn your fish to the opposite undissected side. Notice the lateral line beginning at the operculum and ending at the tail. Its purpose is to detect vibrations. Of what importance is this to the fish?

13. Before you dispose of your fish, check the Friend or Enemy lab and do the questions pertaining to Parasites found on fish.

Dissection of the Fish

Behavioral Objectives

Upon completion of this lab the student will be able to:

1. Define: Operculum, gills, arch, filament, raker, dorsal, ventral, anterior, posterior, lateral, anal, esophagus, stomach.
2. Explain how water circulates in, through, and out of the fish.
3. Tell the function of a gill in a fish and explain how it works.
4. Show notes, diagrams properly labeled, and answers to questions on this lab to his instructor.
5. Properly dissect a fish to the extent that the organs are made visible in their normal positions.
6. Describe how a fish is adapted to catching, holding and digesting its food by mentioning at least four organs involved.
7. Tell what a swim bladder is, what it does and where it is located.
8. Explain the functions of fins and large muscle areas.
9. Show where the nostrils are located and give a good theory as to why they are located there.
10. Show where the lateral line is and give its function.

Crustacean Lab

Crayfish-Lobster Adaptations

Purpose: To study a crayfish and determine how it is adapted to survive.

Procedure: Obtain a preserved crayfish, then answer the following questions regarding it.

Looking at the specimen dorsal side up:

1. Is one claw larger than the other?_____
2. Account for this._____
3. Is the exoskeleton hard or soft?
4. Of what advantage is this to the crayfish?
5. What must happen if the animal is to grow larger?
6. When in the life time of a crayfish is the animal more vulnerable to attack by predators?
7. What conclusions can you make about the color and markings on the crayfish?
8. When a crayfish is escaping from an enemy and is traveling very fast, in which direction does he go-forward or backward? Support your answer.
9. Look at your specimen under the stereo dissecting scope. What did you discover about the eyes?
10. Return your animal to the container for others to use.

Dissection of the Clam

Purpose-To study the adaptations of a mollusk. A mollusk is a soft bodied creature. However, most have a hard, protective shell formed about themselves.

Procedure:

1. Obtain a clam, rinse it under the tap, and put it in a dissecting pan.

2. Note the shell consists of two parts, called valves. The valves are hinged together by an elastic liganment at the Umbo (lump). This is the oldest part of the shell. Each year a ring of shell is added.

3. Determine the age of your clam _____ yrs.

4. With the umbo facing up and to your right, you should be able to locate the siphons at the left end of the animal. This is the normal position of the clam when it is in the sand or mud. There are two siphons, the lower, (incurrent) through which water flows into the animal, and an upper one (excurrent) through which water flows out of the animal.

5. Use a scalpel, cut the two large muscles which hold the valves closed. They are located on either side of the hinge. Note the tooth like projections that fit into graves on the opposite shell. What purpose do they serve?

6. Examine the intenor of the shells. The smooth glistening surface is called the Pearly layer. Of what advantage is this smooth intenior surface?

7. Examine the foot. By extending it and then flattening it out in the sand it becmes anchored. When the clam pulls it in the clam actually is pulled deeper into the sand or mud.

8. Examine the shell-like gills. What two functions do they serve?

9. Draw a diagram of your clam and label the following parts: Umbo, Valve, Incurrent and Excurrent Siphons, Gills, Foot, Pearly Layer.

10. From what you have now observed and read, Why do you think the Mallusks are called "Filter-Feeders"?

11. What roles do they play in the ecosystem of the ocean?

Dissection of the Clam

Behavioral Objectives

At the completion of this lab, the student will be able to:

1. Define: valves, umbo, incurrent--excurrent siphons, pearly layer, foot, gills, hinge, mollusk.
2. Determine the age of a clam.
3. Describe the normal position of the clam in the sand or mud.
4. Describe the low of water through the clam.
5. Give the function of the tooth-like projections on the shells.
6. Explain how the foot is used by the clam.
7. Show notes, data and diagrams properly labeled to his instructor.
8. Describe the role mollusks play in the marine ecosystem.

"Gross Anatomy Lab"

Using your field notes from your first field trip and a stereo microscope take a closer look at your preserved sea urchin, sand shrimp, crab, limpet, sponge, periwinkle, and starfish.

You Will Need

Field notes, stereo microscope, petri dishes

What To Do

1. Look at each one of these sea creatures carefully under the stereo microscope. Put it in a petri dish to view it.
2. Describe all of the adaptive features each on exhibits for survival in the sea. Remember, in order that a species of organisms does servive they must be able to get food, have some means of protection, reproduce offspring and get oxygen.
3. Draw any odoptive features you feel are important.

Questions

1. Do you feel that your creatures are well adopted to a sea environment?

"Behavioral Objectives"

Given the necessary equipment, materials, or resource, each student will:

1. Describe all of the obsered adaptive features each of the seven sea creatures exhibited.

2. Draw adaptive features you feel are important for each of the seven creatures.

3. Explain whether your creatures are well adapted to a sea environment.

Film Study Sheet

"Waves Across The Pacific"

1. Explain the wave terms frequency, amplitude and length.

2. Describe how wave frequency, amplitude and length are modified by the passage of a wave across thousands of miles of ocean from the starting point to the end.

3. Describe two methods that are used for wave study.

4. Explain the process of wave dispersion.

5. Explain the difference between group and phase velocity.

Film Study Sheet

"The Beach: A River of Sand"

1. Describe four differences in ocean shores.

2. Explain why large volumes of sand are present in the surf of many ocean shores.

3. Explain how currents are produced by waves.

4. Explain how most of the pronounced wet movement of sand is usually along the shore.

"Dissolved Oxygen Test Lab"

What To Do

1. Fill the glass stoppered bottle with the sea water to be tested by allowing the water to over flow the bottle for two or three minutes. Be certain there are no air bubbles in the bottle.

2. Add the contents one each. Dissolved Oxygen I Powder Pillow (Manganese sulfate) and Dissolved Oxygen II Powder Pillow (Alkoline) odideazede) stopper the bottle in such a manner as to excude air. Usually by quickly thrusting the stopper into the bottle neck will work. Shake, but not too much, to mix and allow the floc that is formed to settle.

3. Remove the stopper and add the contents of one Dissolved Oxygen III Powder Pillow (Dry Acid). Restopper and shake to mix. The floc will dissolve and a yellow color will develop. This is the prepared sample.

4. Fill the calibrated plastic measuring tube level full with the prepared sample, and pour it into the square mixing bottle.

5. Add PAO solution drop by drop to the square mixing bottle, swirling to mix, counting each drop, until the color changes from yellow to colorless. The ppm Dissolved Oxygen is equal to the number of drops used. Record your data and compare it with other members of the class.

Question

How did your data compare with other members of the class?

Behavioral Objectives

Given the necessary equipment, materials, or resources, each student will:

1. Demonstrate the proper lab procedure for testing sea water for oxygen content.

2. Demonstrate accuracy of results by showing your results to your instructor.

3. Explain a comparison of your data and that of other students.

"Measuring Salinity Lab"

Salinity can be measured very nicely using hydrmeters to determine the specific gravity of a sea water sample which can then be converted to a salinity value with the use of a simple conversion chart.

What To Do

1. Place a sea water sample and a thermometer in the hydrometer cylinder.
2. Place the hydrometer in the cylinder.
3. Record the temperature in C^{o} and the hydrometer reading.
4. Convert the temperature and specific gravity to salinity using the chart provided.
5. Record your salinity reading.

Question

How does your data compare with that of other students?

Behavioral Objectives

Given the necessary equipment, materials, or resources, each student will:

1. Demonstrate the proper lab procedure for testing sea water for salinity.

2. Demonstrate accuracy of results by showing your results to your instructor.

3. Explain a comparison of your data and that of other students.

"pH Lab Test"

The acidity or alkalinity of a sea water has a lot to do with the kinds of life found there. This is a very simple test that can be done in the field to determine pH.

What To Do

1. Completely rinse out a glass test tube with some of the water to be tested. Be sure the tube does not contain any sea water from someone elses test.

2. Fill a clean test tube to the mark with a sample of the water.

3. Add six drops of Wide Range 4, stopper the test tube and invert it to mix. Insert the test tube in the middle hole in the front row of the viewing block.

4. Fill tow test tubes with sample and insert them in the outside holes in the front row of the viewing block.

5. Insert the clean ampule in the middle hole in the back row.

6. Select the proper color for the best color match using the color standard ampules by inserting them in the viewing block. View the colors against a white background using a daylight fluorescent lamp, or against the daylight sky.

7. Record your results.

Question

How do your results compare with those of the other students?

Behavioral Objectives

Given the necessary equipment, materials, or resources, each student will:

1. Demonstrate the proper lab procedure for testing sea water for pH.
2. Demonstrate accuracy of results by showing your results to your instructor.
3. Explain a comparison of your results and those of other students.

North Hampton Beach

Field Trip II

Upon your return go to the same location you had on your first trip by using your reference point guide line recorded in your field notebook. The observations and collection of data will be more extensive on this trip.

You Will Need

Thermometer
pH, oxygen, and salinity test equipment
field notebook

What To Do

1. Observe your "4X12" scraped rock and note any changes that have occurred and explain why.

2. Complete the data sheet by making observation counts of organisms identifying plants and animals and by running chemical tests at each tide pool you examined on your first trip.

3. After returning to school start preparing your report of this trip. It should include the following points.

   a. Introduction-Which briefly explains what you did as a team
   b. Materials
   c. Procedure-At the Tide Pool Area
   d. Data-All that was collected
   e. Discussion of Data-High lights of data
   f. Conclusion-Differences found at your pools and possible reasons for these differences and their possible effects on life found there

This report will be due one week following the field trip.

Helpers

See the "Bailey Island Report" on the lab desk for further ideas on doing your write-up.

TIDE POOL DATA SHEET

LOCAL _____ TIME _____ TO _____ DATE: _____

HABITAT	OCEAN EDGE	TIDE POOL (1)	TIDE POOL (2)	TIDE POOL (3)	TIDE POOL (4)
1. PHYSICAL					
1. TEMP AIR					
SURFACE					
MID					
BOTTOM					
2. POOL SIZE					
DEPTH					
VOLUME					
3. SUBSTRATE					
4. CLOUD COVER IN PERCENT					
2. CHEMICAL					
OXYGEN					
ph					
SALINITY					
3. BIOTIC					
QUANT. # P/A SPECIES					
DOMINANT P					
DOMINANT A					

P= PLANTS

A= ANIMALS

Behavioral Objectives

Given the necessary equipment materials or resources, each student will:

1. Demonstrate the proper field techniques for testing salt water for oxygen, pH salinity and temperature.

2. Demonstrate accuracy of results after testing by showing the results to his instructor.

3. Demonstrate the accuracy of biotic and physical factor observation by showing the tide pool study sheet to your instructor.

4. Write a report in the prescribed manner of the field trip based on collected data.

5. Demonstrate accuracy in returning to the same tide pools location as field trip I.

6. Observe and note in your field notebook any changes that have occured on your "4X12" scraped rock.

7. Explain these changes.

Video Tape Study Sheet

"500 Million Years Beneath the Sea"

1. Describe what man has done to cause the death of coral reefs.

2. Describe the kind of sea life found in a "dead" coral reef area.

3. Describe how two types of sea life was well suited to live in a "dead" coral reef area.

4. Explain three benefits that man derive from the sea.

INTRODUCTION TO LEATHERCRAFT

INDUSTRIOLOGY PROGRAM

Contoocook Valley School District
Supervisory Union 47
Peterborough, New Hampshire

January 1973

Prepared by: Bruce McPherson
Robert W. Harkins
R. E. Rivest

Program Consultant: John L. Davy

Funded by: Project World of Work
PL 90-576

INDUSTRIOLOGY PROGRAM

Antrim - Peterborough

Instructor

(Student)

(Homeroom Teacher)

Course Outline:

Introduction to Leathercraft

This course is designed to introduce the student to the field of leathercraft. The student through the use of field trips, informal discussion, and the successful completion of a basic leathercraft project will become aware of the different types and uses of leather, as well as an introduction to basic leathercraft tools. Among these tools will be the scratch awl, mallet, square, leather shears, skive, punches, razor knife, draw gage as well as others. Emphasis will be placed on the safe usage of all of these tools as well as safety in the craftshop.

Expectations:

Emphasis will be placed on the student's self evaluation in terms of accuracy, neatness, and usefulness of the finished leathercraft project. A basic understanding and appreciation of the craft of leather will be assessed in the demonstration of the course objectives.

Homework Assignments, Unscheduled Time:

Homework assignments should be completed at the direction of the instructor. Unscheduled time will be necessary to complete aspects of the project which are not done in class. These may be completed during the designated open lab.

Evaluation:

Course objectives will be issued to the student. These will clearly define his course of study.

INDUSTRIOLOGY PROGRAM

LEATHERCRAFT

Introduction to Leathercraft

The following is a list of objectives that are to be completed, initialled by the instructor, then turned in on or before _____.

1. List four rules governing safety in the craftshop.

   A.

   B.

   C.

   D.

2. Name three steps in the processing of leather.

   A.

   B.

   C.

3. Demonstrate ability to trace pattern on leather using a scratch awl.

4. Demonstrate ability to cut leather using both a razor knife as well as shears.

5. Successful demonstration of creasing all edges which are not to be laced, with a bone edge creaser.

6. Demonstrate the ability to use a safety beveler in skiving all edges which are to be laced.

7. Align all pieces of project and use rubber cement to secure all edges to be laced.

8. Demonstrate ability to use punches and accurately lay out holes on project.

9. Lace all edges using one of three basic lacing techniques.

10. Finished project will be evaluated in relation to:

    A. Clean Lines
    B. Cleanliness and accuracy
    C. Lacing hole alignment
    D. Lacing, stitch execution
    E. Skiving, folding and creasing

INDUSTRIOLOGY - LEATHERCRAFT

PROGRAM

Outline

I History of Leatherworking

II Processing and Sorting Leather

III Safety in the Craftshop

IV Layout and Cutting Tools

V Pattern Layout

VI Assembling a Leather Project

a. Punching

b. Snaps and other Fasteners

c. Gluing

d. Lacing

e. Sewing

VII Leather in Industry

VIII Tooling Designs on Leather

IX Cleaning and Applying Finish to Leather Articles

X Bibliography

INDUSTRIOLOGY PROGRAM

Grade: _____ Date: _____

Lesson No. 100

Title of Lesson: HISTORY OF LEATHERWORKING

Goals: To familiarize students with uses, processes in preparing and the importance of leather.

Objectives:

Each student will demonstrate a familiarization with one of the following (early uses of leather, ancient methods of processing leather, importance of leather) by designing a project (paper, demonstration, collage', poster, oral report, etc.) on one area of his/her own choosing.

Student Activities:

Read handout sheet and discuss.

Assignment:

1. Prepare for presentation of project.

Teacher preparation (film guides, worksheets, field trips, speakers, etc.)

1. Duplicate hand out (History of Leather)

Supplies and Resources Needed:

Consumable	Non-Consumable
Colored Poster Board 24" X 24" Magic Marker Assortment	

THE HISTORY OF LEATHER

Early cave man tried to make use of most things he came in contact with. It wasn't long before he had made a very good use of the hides of animals he had killed for food. The skins that he took from the animals' bodies were of little use until he learned how to preserve them.

Where early man lived and the type of weather he had to withstand made a difference in the way these animal hides were used. It also made a difference in the ways he went about preserving the hides into leather.

With small skins he made bags to carry water (long before he had invented pottery). With these he could make longer and longer journeys. With tough skins he could make shields to defend his home or conquer new territory.

Leather was also important to the way early man organized his tribe. When the leather was pulled across a hollowed log, it formed a drum. The drum was used for getting messages over great distances and also for religious rites.

The Hebrews were the most skilled of the early leather makers. They learned the beginnings of their art from the Egyptians. Excavations in Egypt have unearthed some leather articles that are thousands of years old but are still in good shape.

The knowledge of tanning hides was so important that it was kept secret within the family. The processes were almost entirely done by the women of the tribe. When the leather was too stiff to become comfortable clothing, the women made it soft by chewing it.

Leather was prized like gold, silver, ivory, and rare woods by the early Egyptians and their neighbors. The ancient Greeks used leather for armor, the building of ships, and for sails, houses, and clothing. It was so important to the Romans that it was once used as a basis for money.

Knowledge of vegetable tanning has been used for many thousands of years. In the early Roman Days, tanning with bark and using different woods and berries was common. Pieces of different colored leather have been found in Egypt that date thousands of years old.

A parchment is the skin of an animal which has been prepared to be written on.

Through the Middle Ages, until the 14th century, parchment was used by the monks for writing all the knowledge of the ancient world.

In medieval Europe, large amounts of leather were being made. Most countries of Europe were making some leather before the discovery of America. During this period the leather industry developed skilled artisans. Before the 16th century, leather became one of the most important articles of trade in many European countries.

In the eighteenth century, vegetable tanning and the use of specialized instruments and crude machines were well known. Until the end of the nineteenth century, the only basic change in leather production was the introduction of power driven machinery.

When the European explorers reached North America, they found that the Indians also tanned hides. They used the leather for footwear, clothing, shelter, bedding, and for many other things.

Ways of tanning, varied with the tribes. The process which they perfected for making a soft leather known as buckskin tan is the one most widely used today. Its softness, pliability, and water resistance quality has never been surpassed.

Tanning with chrome salts was introduced at the end of the nineteenth century and was probably the first change in the chemistry of leather production in about two thousand years.

The tanning process was shortened from weeks to days with the introduction of chrome salts.

From an ancient art, leather production has been transformed into an industrial process that can be carried out wherever the raw materials are available.

From early man, scraping hides with sharp stones and women chewing the hides to make them pliable, we now have complex machinery and monstrous vats in large factories. This important job for mankind has been with us for thousands of years.

INDUSTRIOLOGY PROGRAM

CONVERSATION WITH A TANNER

What is meant by specialty tanning? The best way to explain this is to tell you exactly what happens when a customer places an order to the tannery. First of all the customer will state characteristics and special specifications that he would like his leather to have. These characteristics and specifications are different for each customer depending on what product he is making out of the leather. Once the tannery sees the order, it is given to the tanner who through the use of different chemicals can give the customer the desired specifications and characteristics for the leather. The term specialty tanning means each customer's order is different than the next customers because the desired characteristics and specifications are also different. Therefore, the order for each customer has to be treated on an individual basis. Now that we understand the term "specialty tanning" we can get on with the tanning process itself.

As you all know, leather is made from hides of animals. This brings up one more question. Where do we get these hides? This particular company purchases hides from meat packing companies along the Eastern Seaboard. Therefore we are not concerned with transportation. Once the animal is slaughtered for beef, the hide is stripped off the animal, folded into a square bundle and salted for preserving the hide until it is transported to the tannery. The salt is the only preservative used, therefore the hides have to be shipped in a relatively fast manner, otherwise bacteria will set in and decomposition of the hide will begin. Once the hides arrive at the tannery either by truck or rail, they are unpacked and stacked on pallets. They then are transported to what is called the "beam house" by a fork truck. The hides are then unbundled and opened up over a trimming horse. Here the heads and legs are trimmed off and the hide is sliced down the backbone. The reason for the splitting is because the machines are not capable of handling a whole hide at one time. So the hide is split in half and this one hide now becomes two backs. The hides now are ready for the dehairing process.

The hides are put into a soak bath where the de-hairing process starts. A soak bath is nothing more than a large washing machine where the water temperature is 80° - 85° F. The hides are washed for about 30 minutes; after this the hides are soaked in a soda ash-disinfectant solution overnight. After 24 hours the hides are rinsed in water at a

temperature of 76°. Now chemicals are added such as lime, sulphate and sulphuric acid which forms a caustic that chemically burns the hair out of the hide. The hide is left in this solution for 12 hours. Then the hide is washed for 3 hours in water temperature of 70° which is slowly cooled to a 60° temperature. At this time lime is added to the water solution. This is called a re-lime bath. The reason for this is that it makes the hide much easier for the employees to handle. It is not quite as slippery and slimy as it would be if there were no re-liming bath process. The hide now goes through a slushing process. This is nothing more than a big set of rollers which the hide is fed through and the water from washing is squeezed out of the hides. It flattens the hide out and makes the hide a little more uniform in thickness.

After slushing the hide goes to a splitting machine which is nothing more than a ban knife, similar to a band saw on its side. The hide is fed through one thickness on the feeding side of the machine and comes out two pieces on the other side of the machine. The hide is actually split in half thickness-wise. This gives you two different kinds of hides. The best kind or more expensive kind is top grain and the bottom which is called the split. The top grain hide is now at a uniform thickness. The split, a much cheaper leather, is used for suedes, workshoes, work-gloves, and cheap leather items.

The top grain hide is the hair side of the animal and therefore is more expensive. Now the hides proceed to the tanning room where the hides are now transferred to a tanning drum. The hides are now washed for 40 minutes in water 80° to 94°. This process is called de-liming which removes the lime that was added on the re-lime bath and to cleanse the hide. The hides at this stage are very thick and fatty. Once the hides are de-limed it will become much more thin and uniform. The hides are now ready for the tanning process. This is where specialty tanning comes in again. Each customer has to have special ingredients added to the tanning process to give his leather the characteristics and specifications he desires.

We should stop here for a moment and describe the two basic types of tanning. One is called "Chemical Tanning" and the other "Vegetable". There are two distinct differences in the two tanning processes. Chemical tanning, which is what most leather goes through, is tanned with all chemical elements; in other words, all man-made elements. There are certain advantages and disadvantages to this type of tanning. One

advantage is that when the leather is tanned it can be left in almost any state without damaging the leather. One disadvantage is the stiffness and rigidity in the leather is lost. Therefore, if you were making a briefcase, piece of luggage, or a product of this type you would want your leather to be tanned in a vegetable tanning process. Vegetable tanning which uses all natural elements, for example, vegetable oil, sap from tree routes, etc. gives you a much stiffer and durable type of leather. The process in which the leather goes through is determined again by the characteristics that the customer desires in his leather.

The tanner decides which process will be used to best suit the customer's needs. The tanning process takes 24 - 36 hours before the hides are completely tanned. Once the hides are tanned, they are rinsed with a water solution to remove any excess chemicals. Then the hides are removed from the tanning drum.

When the hide starts the de-hairing process it weighs about 85 to 90 pounds but after it is split and tanned it weighs about 30 to 40 pounds. This is still quite heavy for the hide because it is still saturated with water. It now goes through a machine with two large rollers that squeezes about 30% of the water out and then the leather goes to a drying machine where it is placed on large panels and run through a huge drying machine. When the leather is completely dry it will weigh about 8 to 9 pounds. This leather is about 6 to 7 ounce leather.

When we talk about once measurement, we are talking about the thickness os the leather. This could be confusing to some people but briefly, three ounce is equal to 1 millimeter in thickness, therefore, a 6 ounce piece of leather is 2 millimeters thick. Most hides can be made to varying thicknesses; the thickness being determined by the setting on the splitting machine.

The leather is not at its proper thickness at this time for we have one more operation which is called a buffing operation.

As you recall, when the leather was placed on the large board that transported the leather through the drying machine it was "pasted" to the board. Now we have to remove the paste from the hides. This is done with the use of a buffing machine. The buffing machine removes paste from the hides so they can be finished.

The buffing machine is nothing more than two round drums with a sand paper type material on the drum. The leather is fed through and sanded on both sides very slightly. After the leather is buffed, it then goes to a station where a man grades the leather. In other words, very good leather, poor leather, medium quality leather, etc. Defects in the leather make the leather go to a poor grade. For example, if the animal when alive had caught himself on a barbed-wire fence, this would scratch the hide. When the leather becomes finished, this scratch would also appear in the hide, making the hide a poor quality hide.

The leather now goes to an embossing machine. If the customer desires a certain grain type, for example, the grain of an alligator, a moose, or an elephant, this grain is placed on the leather with the use of the embossing machine. The embossing machine has large steel plates which are inserted into the machine. Each leather grain has its own plate. The leather is placed in the machine and then the design is stamped on the leather.

The leather is now ready to go to the finishing room. If a color is to be added to the leather according to the specifications of the buyer, it is now sprayed on. The exact color is mixed and sprayed onto the leather such as a paint sprayer would spray paint onto wood. After the color has been added to the leather it goes to the lacquer room. Here a clear coat of lacquer is sprayed over the color at 750°. This lacquer finish is designed to protect the leather from scratches and other abuse. When the hide comes out of the lacquer machine it is still very tacky. It is hung on a rotating horse and dried, then stacked and ready to go to the shipping room.

Before the leather reaches the shipping room, it may be run through a press that has a stainless steel plate with different temperatures on it depending on the amount of sheen which is required. By running this piece of leather through a heated press it will put a sheen onto the leather.

The leather then goes to an automatic measuring machine which uses an electric eye to measure the number of square feet per hide. This number is marked on the hide. For example, if a hide measured 10 1/2 square feet, the hide would be marked with a 10 and a small 2 to the upper right of the zero. If the hide were 10 3/4 square feet the hide would be marked with a 10 and a 3 to the upper right of the zero. Hides

are only measured in quarters (1/4, 1/2, 3/4).

The hides are now ready to be packaged and shipped to the customer. Each order was treated as an individual order with special chemicals added to produce special characteristics in the leather. The order is now ready to go to the customer being tailored to his specifications.

INDUSTRIOLOGY PROGRAM

Grade _____ Date: _____

Lesson No. 200

Title of Lesson: PROCESSING AND SORTING

Goals:

To develop an understanding of basic tanning processes and sorting procedures.

Objectives:

1. Each student will identify and briefly describe the two basic tanning processes. (Vegetable and chemical) and give examples of where each process is used.

2. Given handout sheet, (characteristics of hides) each student will identify and describe 6 types of hides in terms of sizes, weights and uses.

Student Activities:

1. Slide presentation with tape.

2. Discuss - characteristics of hides.

3. Discuss - Helpful Hints

4. Conversation with a tanner.

Assignment:

Study - Conversation with a tanner.

Teacher preparation (film guides, worksheets, field trips, speakers, etc.)

Set up slides and tape (projector and cassette recorder)
Handout:
1. Characteristics of hides.
2. Helpful hints.
3. Conversation with a tanner.

Supplies and Resources Needed:

Consumable
Prepare Handout Sheet

Non-Consumable
Arrange for slide projector and tape recorder.

INDUSTRIOLOGY PROGRAM

LEATHER - HELPFUL HINTS

I Classification

A. Hides

1. Large Animals
   a. Cow
   b. Steer

B. Skins

1. Smaller Animals
   a. Calf
   b. Sheep

C. Kips

1. Small Hides

D. Sides of Leather

1. Grain Side
   a. Hair Side
   b. Smooth Rich Surface

2. Flesh Side
   a. Inner Side - next to body
   b. Rough Surface

II Description for Purchasing

A. Skin

B. Half Skin

C. Quarter Skin

D. Sized
   1. On Flesh Side
   2. 1, 2, 3, = 6^2 = 6 1/2 sq. ft.

E. Square Foot

F. Pound
   1. Scraps
   2. Damaged

III Storage

A. Dry Place
B. Do Not Fold
C. Dark Place
D. Roll

INDUSTRIOLOGY PROGRAM

CHARACTERISTICS OF HIDES

Type	Description	Thickness (In ounces)	Size (Sq. Ft.)	Uses
Calfskin	Very fine grain, from the skins of young	3 - 4	12 - 15	Finest grain for tooling.
Cowhide	Thick, strong, smooth finish			
a. Light		2 - 3 1/2	18 - 25	Men's and women's wear, jackets, vests, upholstery.
b. Medium		4 - 7	18 - 25	Easily carved and tooled, small projects
c. Heavy		8 - 10	16 - 20	Good for larger tooling projects.
Goatskin	Thin but long wearing comes in limited colors. Known for its rich red hue.	2 - 3	4 - 6	Dyes well, book bindings, belts wallets, small articles.
Pigskin	Tough and durable with interesting grain - inexpensive	3 - 4	5 - 8	Hard wearing items purses, wallets book bindings.
Sheepskin	Smooth and pliant from the haired sheep (woolly sheep do not produce leather	2 - 3	5 - 9	Women's clothing, jackets, skirts, coats, vests.
Steerhide	Heavy and strong, crinkle grain finish; natural tan and some reds and browns, sometimes comes in two or three tone hides. Suede is made by roughening and buffing the flesh side of selected skins to create its nap or pile finish. The process was first developed in Sweden and named Suede, or Swedish, by the French. Today many animal skins are sueded.	3 - 4	12 - 15	Large tooling projects, saddles, briefcases, suitcases.

INDUSTRIOLOGY PROGRAM

Grade: _____ Date: _____

Lesson No. 300

Title of Lesson: SAFETY IN THE CRAFTSHOP

Goals: Develop safe working habits in the craftshop.

Objectives:

Each student will pass eith 100% accuracy an instructor made test on safety in the craftshop.

Student Activities:

Discussion and demonstration with instructor on safety.

A. Procedures
B. Clothing
C. Work Habits
D. Equipment

Assignment:

Make Safety Posters

Teacher preparation (film guides, worksheets, field trips, speakers, etc.)

Develop Safety Test

Supplies and Resources Needed

Consumable	Non-Consumable
Colored Poster Board (24" X 24"	
Set of Magic Markers	

QUIZ

TOOL USAGE & SAFETY

_____
(Name)

_____
(Class)

Directions:

Circle (T) for True or (F) for False. Each sentence involves a statement on tool use.

T F 1. The scratch-awl is used primarily as a layout tool.

T F 2. The safety beveler must be drawn toward you while cutting.

T F 3. The grooving tool must be started in the middle of the work and pushed towards the edge.

T F 4. When sewing with a sewing awl, the leather should be clamped firmly in a holding device.

T F 5. When cutting out your leather you should cut on the outside of the square and should pull the knife toward you.

Directions:

The following questions are multiple choice. Select the best answer and circle it.

1. A tool used in layout work is:

   a) Stitch gage,
   b) Eyelet spreader
   c) Steel square

2. When marking leather you should use:

   a) Scratch awl
   b) Magic marker
   c) Stitch Gage

3. When using the scratch awl to pierce holes in leather, place:

   a) Two thickness of cardboard
   b) Your hand
   c) The table top

   under the work.

4. When using the leather shears you should:

   a) cut toward you
   b) cut away from you

5. When using the stitch gage the proper procedure is:

   a) Roll it across the leather twice
   b) Roll it across the leather once firmly
   c) Neither one

Directions:

List as many safety rules as possible on each of the following tools.

Scratch Awl:

Utility Knife:

Safety Beveler:

INDUSTRIOLOGY PROGRAM

Grade: _____ Date: _____

Lesson No. 400

Title of Lesson: LAYOUT AND CUTTING TOOLS

Goals:

1. To familiarize the students with common layout and cutting tools.

2. To develop safe work habits with layout and cutting tools.

Objectives:

1. Each student will identify by name and proper use, 10 common layout and cutting tools.

2. Each student will demonstrate safe working habits with the 10 tools which he has previously identified.

Student Activities:

Demonstrate safe operation of the tools.

Assignment:

Teacher Preparation (film guides, worksheets, field trips, speakers, etc.)

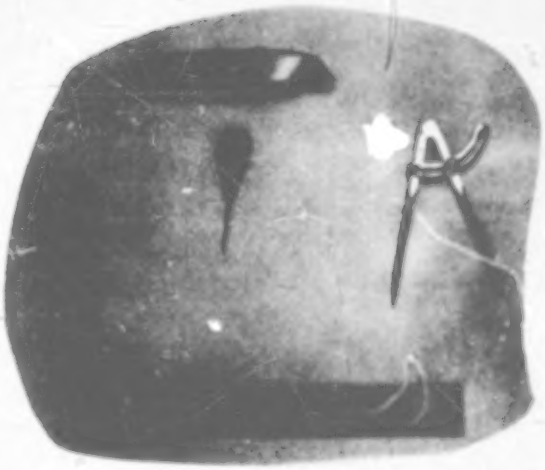
1. Develop an information sheet on layout and cutting tools.

2. Have all tools on hand available for teacher/student demonstration.

Supplies and Resources Needed:

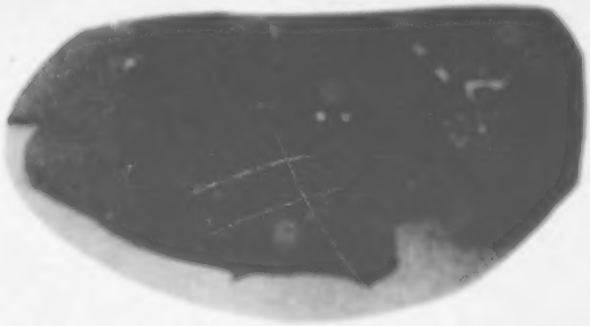
Consumable Non-Consumable

LAYOUT



Basic Layout Tools

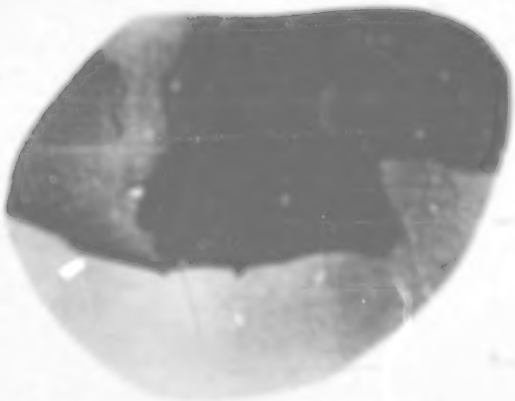
2. Tracing around the template



Hold template down firmly while tracing.

Carefully trace around the inside of all holes.

Small pieces can be placed close to the edge of the leather to conserve the leather.

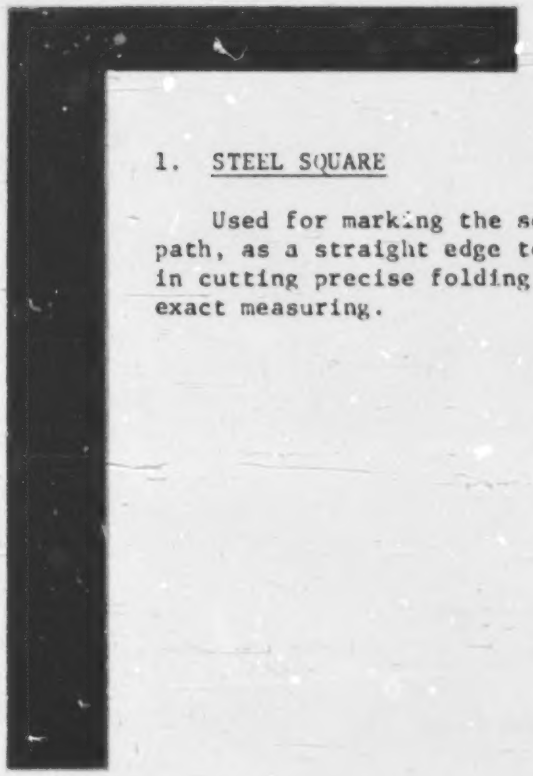


TRACING YOUR PATTERN

Outlining a pattern piece on a skin

Cutting with a knife using a steel square as a guide.

LEATHERCRAFT TOOLS



1. STEEL SQUARE

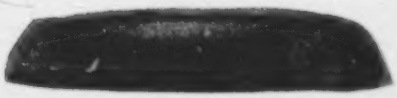
Used for marking the sewing path, as a straight edge to aid in cutting precise folding and exact measuring.

2. SCRATCH ALL

Used to mark leather trace patterns and pierce leather.

3. LEATHER SHEARS

Used to cut irregular shapes in leather.

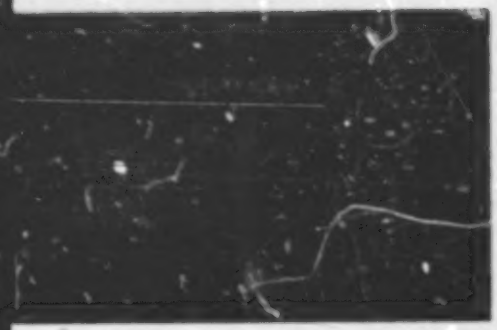


4. UTILITY KNIFE

Used with the square to cut leather.

5. WING DIVIDERS

Used for plotting curves.



6. SNAP SETTER

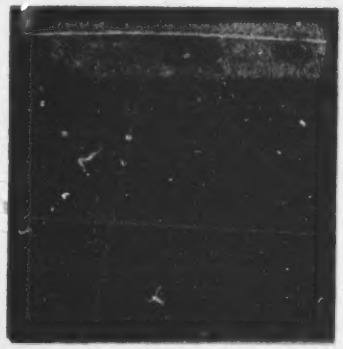
Used to attach snaps to leather.

7. SAFETY BEVELER

Used for skiving any thickness of leather.

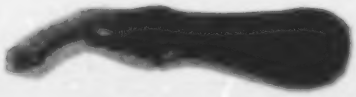
8. THONGING CHISEL

Used with mallet to make slits for lacing.



9. SNAP SETTER

Used to attach snaps to leather.



10. CREASER

Used to crease leather.

11. ADJUSTABLE GOUGE

Used to make bents or folds. also makes a protective groove for saddle stitching.

12. MALLET

Used in conjunction with other tools where a hammer effect is needed.

13. STITCH GAUGE

Used in conjunction with the square for correct marking and placement of hand stitches or lacing.

14. EDGE BEVELER

Bevels or rounds off edges of heavy or light leather.

15. DRAW GUAGE

Used to cut leather into strips.

16. ROUND DRIVE PUNCH

Used in conjunction with the mallet to punch round holes.

17. ROTARY HOLE PUNCH

Used to punch holes for lacing, rivet, eyelets and snaps. Has six different size punches.

18. SEWING AWL

Used for hand sewing on leather.

19. SWIVEL CUTTER

Used for precision cutting of design outlines

20. EYELET AND GROMMET SETTER

Used to assemble eyelets and grommets.

INDUSTRIOLOGY PROGRAM

Grade _____ Date: _____

Lesson No. 500

Title of Lesson: PATTERN LAYOUT

Goals: 1. To familiarize the students with techniques of pattern layout.

Objectives:

Given a drawing board and instruments and instruction in the use of, each student will complete a pattern layoug of his own choosing.

Student Activities:

Lab Session - Design and Layout of a Pattern.

Assignment:

Teacher preparation (film guides, worksheets, field trips, speakers, etc.)

1. Worksheet on layout.

2. Examples of a project in different steps throughout layout.

Supplies and Resources Needed:

Consumable Non-Consumable

INDUSTRIOLOGY - LEATHERCRAFT

INSTRUCTIONS - MEMO PAD LAYOUT

PART A

1. Line up the sheet labelled MEMO PAD COVER on your drawing board using the line near the top as a guide line. Tape the paper near the center of your board.

2. Part A is the body (or largest part) of the memo pad cover and its measurements are 3 1/4" wide and 10 1/2" long. Starting at the corners

use your instruments to complete the drawing. Remember, your finished product will be no more accurate than your drawing.

3. After the pad is folded each side will be 5 1/16" long (with a 3/8" space where the fold occurs). Measure 5 1/16" from each edge and make a small dot in the top line. Using your parrellel edge and a triangle drop a dashed line from each dot to the bottom line. The distance between the lines you just made should be 3/8" --- check it.

4. Along the left edge of your drawing find the center of line xy. Place a dot at this point. Line up your parallel edge with the dot and draw a light line to the vertical line on the right edge of your paper

5. Measure in 1/2" from the right edge and put a dot on the center line. (This will mark the center of a hole for the snap.) Use your triangle on the parallel edge and make a short vertical line through the dot.

6. Measure 5/8" in from the left edge (line xy) and place a dot on the center line. Construct a vertical line 5/16" long which starts at the dot and goes toward the top line. Next, construct a 5/16" line which starts at the dot and goes toward the bottom line. This should give you a 5/8" line, the center of which is the dot.

PART B

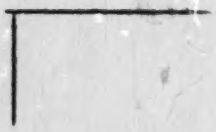
7. Using your instruments, construct an accurate rectangle that is 1 3/4" wide and 3 1/4" long.

PART C

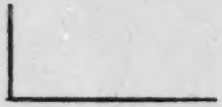
8. Using your instruments, construct a rectangle that is 5/8" wide and 2 3/8" long. Using your instruments, locate the center of a hole that is 3/8" in from the right edge of Part C and 5/16" down from the top edge.

Guide Line MEMO PAD COVER Guide Line

X



PART A



Y

PART B

PART C

INDUSTRIOLOGY PROGRAM

Grade: _____ Date: _____

Lesson No. 600

Title of Lesson : ASSEMBLING A LEATHER PROJECT

Goals:

1. Familiarize the student with the procedure and techniques of assembly of a leather project.

Objectives:

1. Each student will properly assemble the assigned project using the proper tools.

Student Activities:

1. Students will be involved with the teacher-student demonstration. Each student will make the indicated project.

Assignment:

Name 5 industries which use leather in some way.

Teacher preparation (film guides, worksheets, field trips, speakers, etc.)

1. Develop a project which will use as many tools as possible.
2. Have a pattern.
3. Have equipment and leather ready for student use.

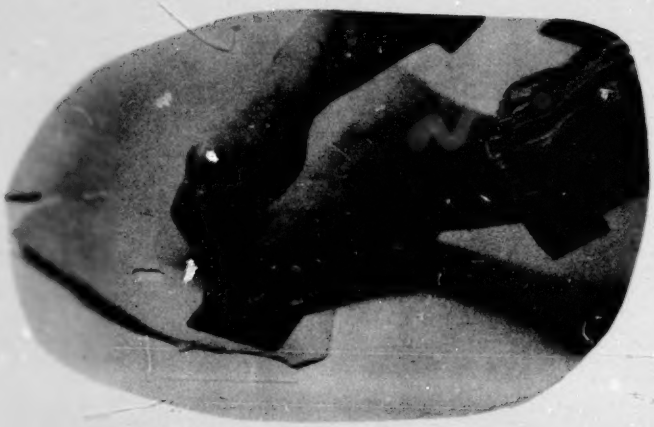
Supplies and Resources Needed:

Consumable Non-Consumable

LAYOUT

Basic Layout Tools

Tracing around the template

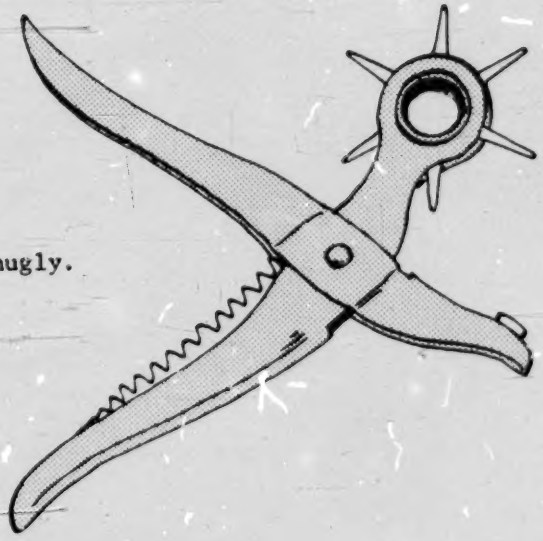


USING SNAPS

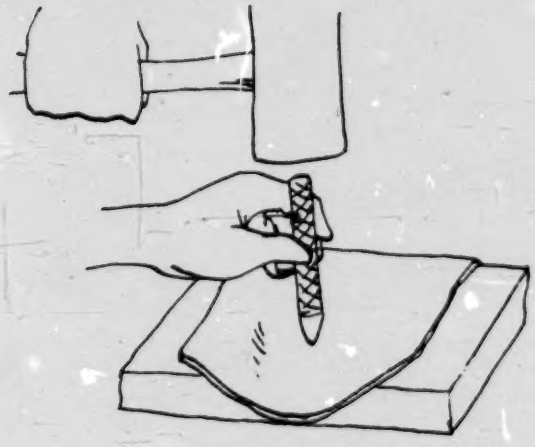
Two methods of punching the holes:

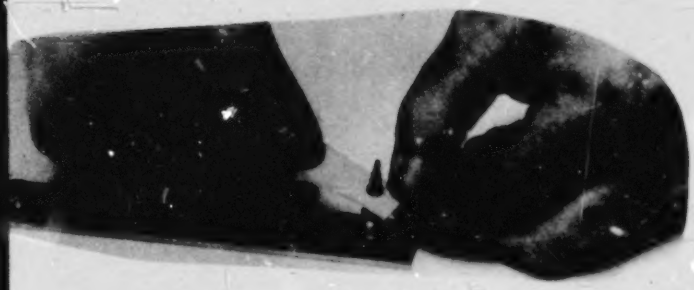
Using a rotary punch.

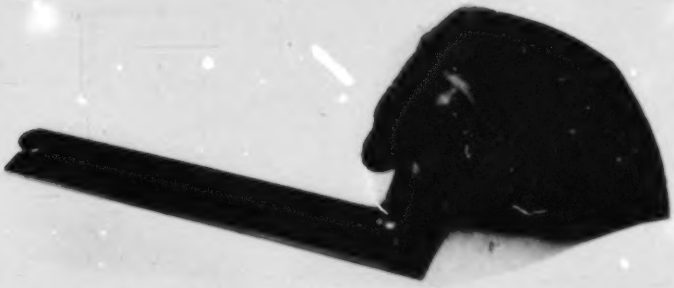
Try to punch hole so the parts fit snugly.

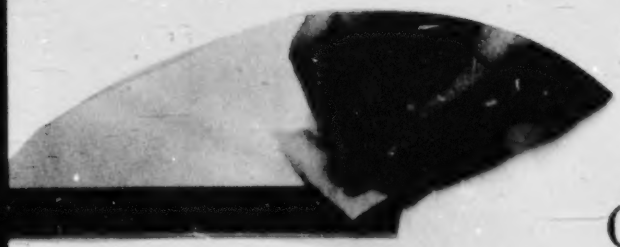


Using a drive punch.

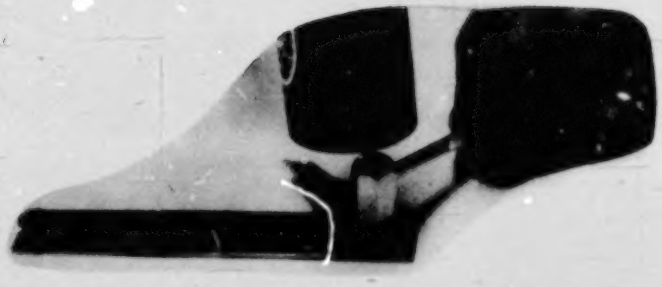




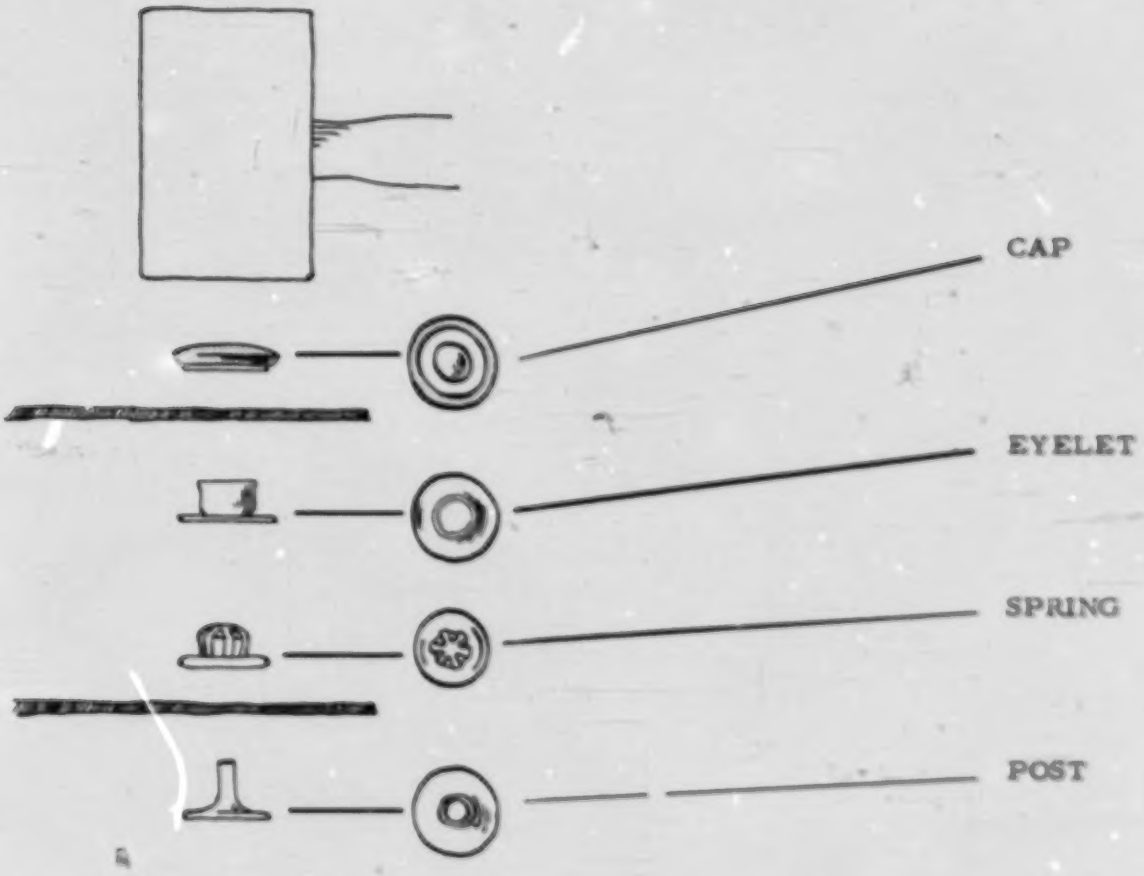




OR

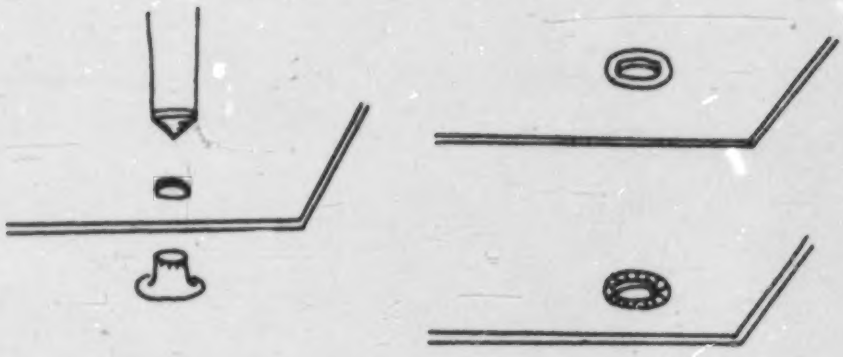


NOTE: Check proper placement of post and eyelet before setting spring and cap. (Make sure they will snap properly.)



EYELETS GROMMETS & RIVETS

Rim of eyelet should be pushed through from the grain side.

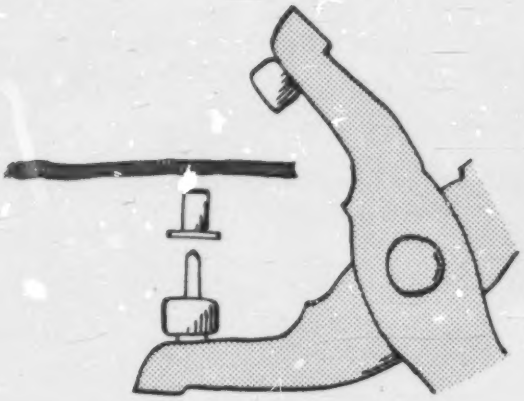


a) Setting an eyelet.

b) Top and bottom view of set eyelet.

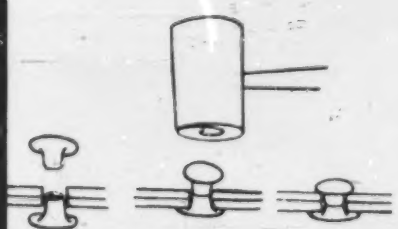
This tool can be used for grommets and eyelets.

GROMMETS



Lining up a grommet to be set.

RIVETS

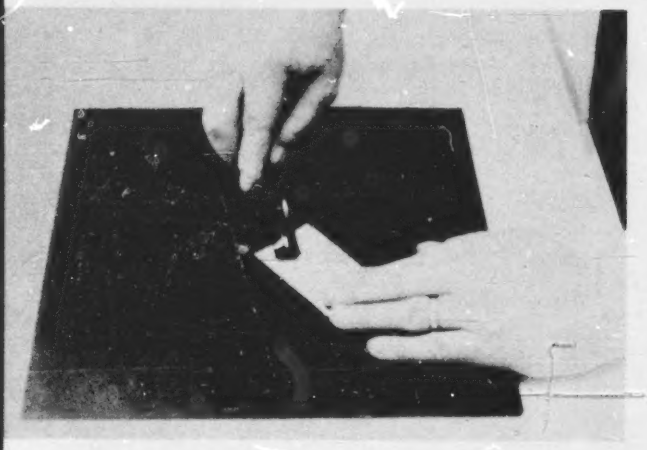


a) Rivet parts.
b) Rivet being set using a mallet.
c) Set rivet.

a) Setting a knobby rivet.
b) Set knobby rivet.

STEPS IN SEWING BY HAND

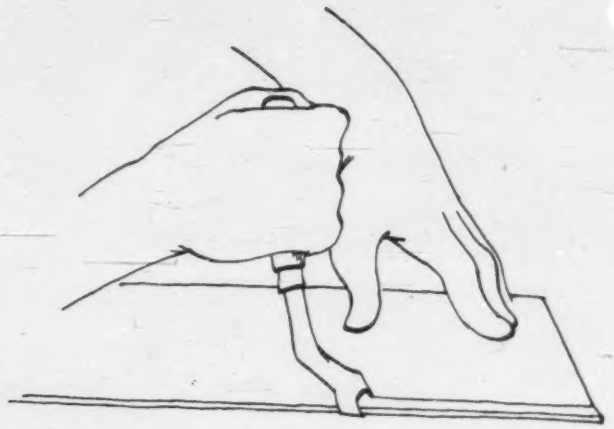
PREPARATION AND TECHNIQUES



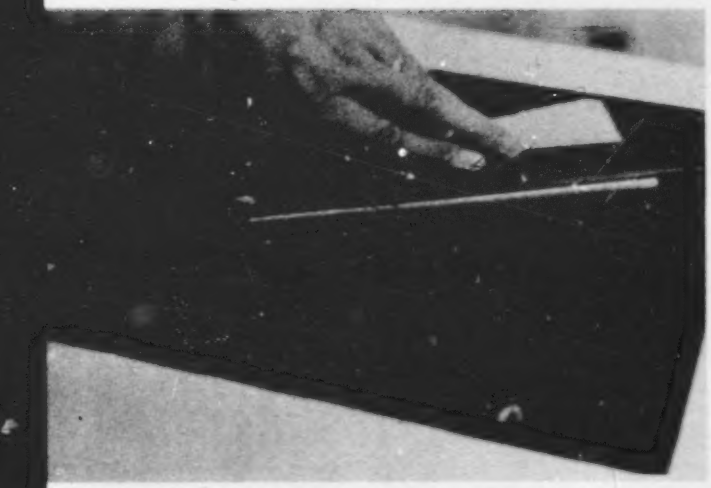
Skive with a safety beveler making certain that you cut away less than half the thickness of the leather on the flesh side of the hide along the seam edges.

The heavy leathers can further be prepared for sewing by hand by making a slight indentation or track for the stitches to lie in. This is done with a tool called an edge creaser. A smooth pointed object can achieve the same effect.

Using an edge creaser.

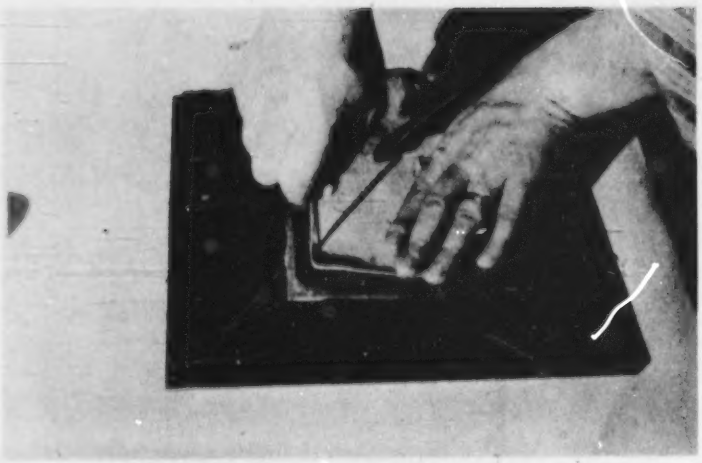


Place the wheel of the stitch gage on the leather and make sure that one of the points of the wheel is resting on the corner mark. Then, using a ruler's edge as a guide, push the stitch gauge firmly forward for even marking.

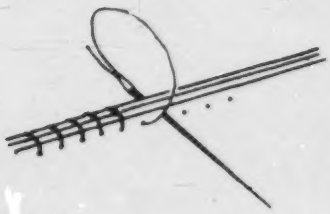


Note: Distance from edge
3/16"

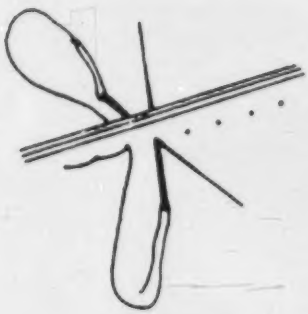
Pierce with scratch awl wherever you have previously made a dot with a stitch gage. Use heavy cardboard under your work.



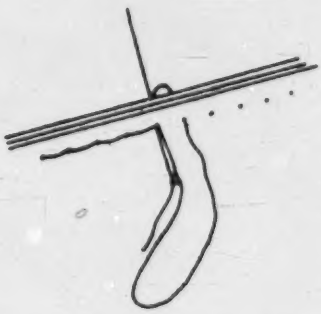
The running stitch



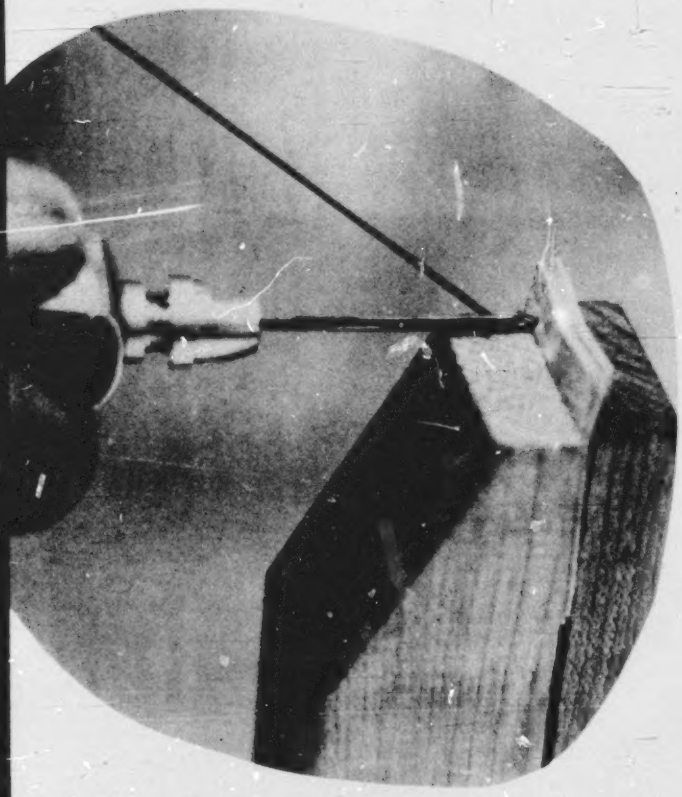
The overcast stitch



The cobbler's stitch

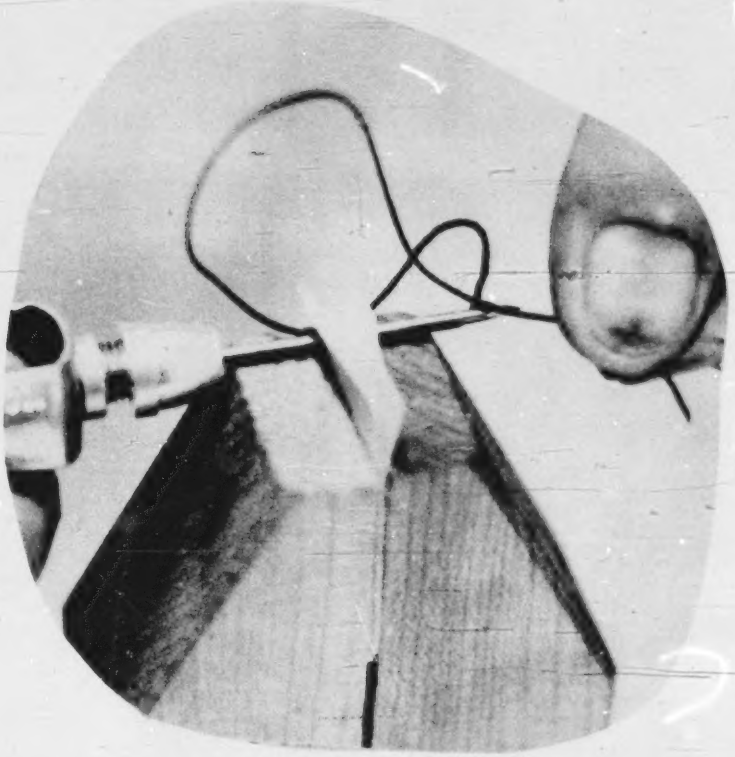


The back stitch



Put thread through needle about 1/2". Hold forefinger firmly on reel so it will not turn, and insert needle through material. Now notice that you have a short thread end on opposite side of material. Pull this thread out about 18 inches or twice the distance of seam you want to sew.

Now..with loose end of thread in one hand. Grasp awl firmly with the other. (Hold reel with forefinger so it will not turn.) Withdraw awl till it has about 1 1/2 inches of thread between material and point of needle. In this position, commence the second stitch.

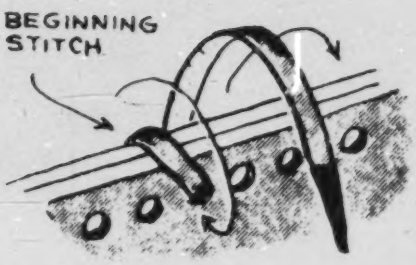


ase the reel and insert needle through
roper distance for width of stitch
red. Now slowly withdraw needle, part
out, holding finger on reel. This will
a loop on opposite side of groove in
le.

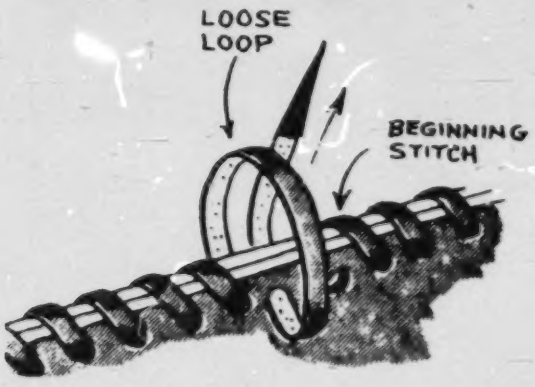
rt this loose end through loop. Holding
reel firmly so it will not turn.
..pull needle and thread with equal
e in opposite directions to form the
ch. Sew with needle in the same
tion at all times.

you have the first and second stitches.
tarting a new stitch proceed as before.

LACING

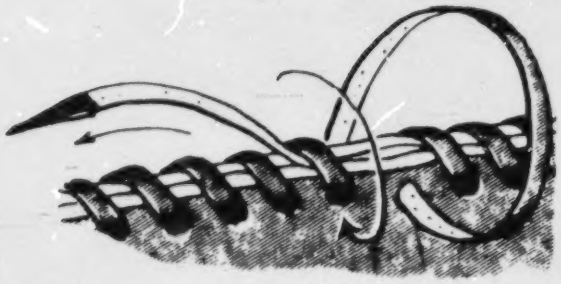


Take up all slack lace by pulling the stitch up tight. Continue lacing as shown.

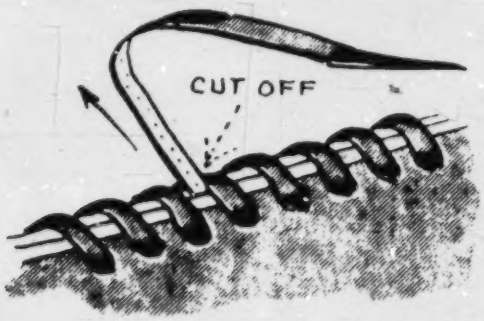


Lace nearly around the project, but stop when you have <u>two</u> holes to go. Your next stitch should be a very loose one because you need to prepare to 'tie off' the last stitch.

At this point, you should have one hole as yet unlaced. Look at the picture carefully. As you do the last stitch, lace up between the pieces of leather and through the first loose loop, as shown.

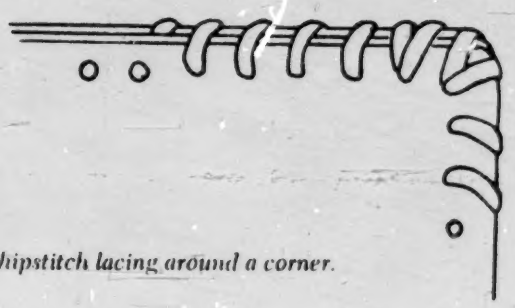


Pull the first loop tight over the end of lace as shown.



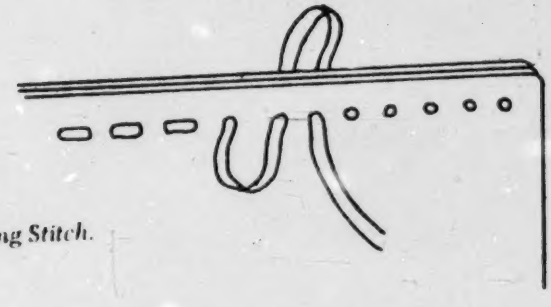
A small drop or rubber cement at the point where you cutt off the lace to make a new end will insure a tight lace. (Make sure your rubber cement is between the pieces of leather.) Then, cut off the end of the lace and flatten the lacing with light taps from your mallet.

The Whipstitch.



Whipstitch lacing around a corner.

THE WHIPSTITCH--this is done by putting the lace in a needle and gluing the other end near the inside seam as with the running stitch. The needle is then brought from the back into the first hole, out the front, over the seam and into the back of the next hole.



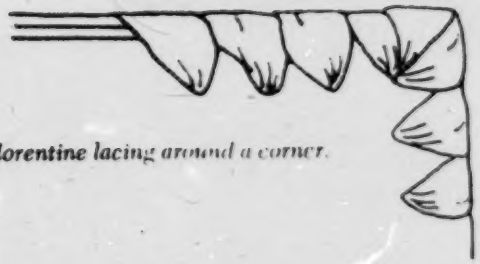
The Running Stitch.

Florentine lacing.

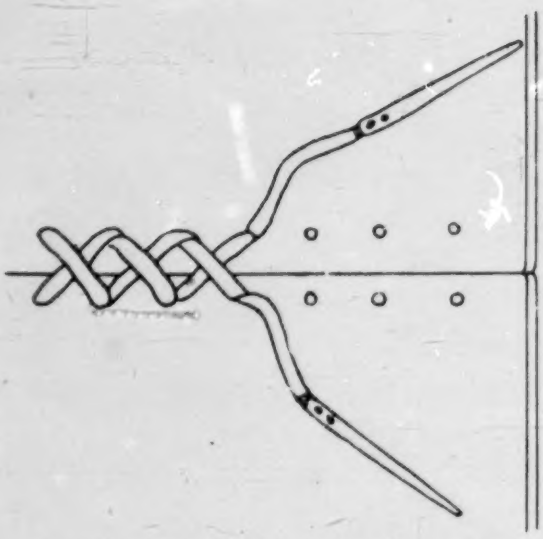
THE FLORENTINE LACE--this type is done with a softer, wider lace that covers the edges of the seam while doing a regular whipstitch. It is the width and texture of the lace itself that gives it a different look. It folds up as it goes into the holes and widens as it covers the edges of the seam. It is done in the same way as the whipstitch.

Since the Florentine Lace is softer, it can be done on corners by simply going into the corner hole three times with no difficulty.

If you prefer, the hole near the corner can be laced twice and the corner hole twice as with the shipstitch. Both stitches are ended in the same way, leave half an inch excess and glue.



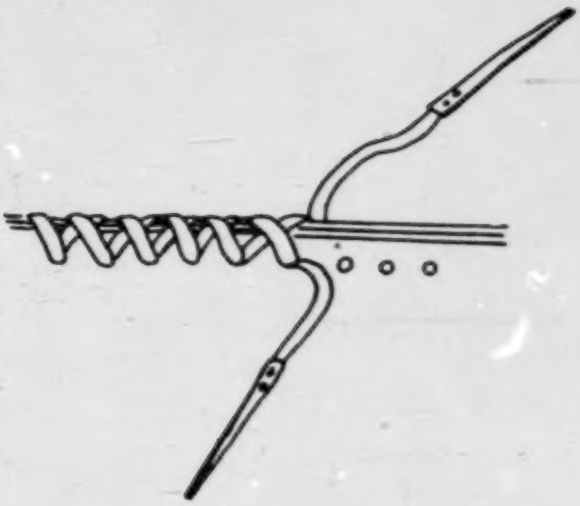
Florentine lacing around a corner.



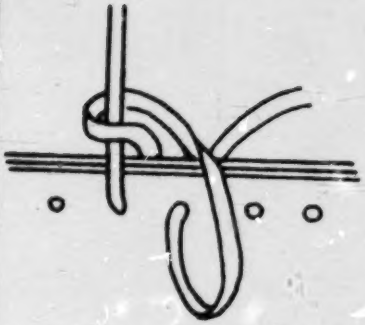
Top view of the double cross-stitch on a flat seam.

THE DOUBLE CROSSTITCH--This is a very attractive lacing technique that uses two laces at the same time. Start by gluing the two lace ends right near the inside of the holes and put the other ends into two lacing needles. If you prefer, you can use one long lace with needles at both ends. Draw the lace through the first hole and leave half the length on each side of the leather.

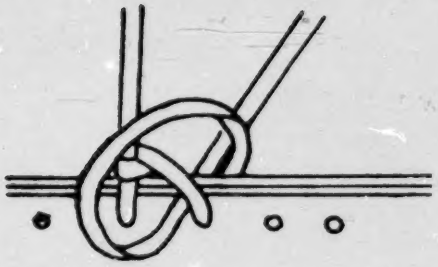
The stitch is done by putting the needles through the same hole, either both at once or one at a time. Then they are crossed over the edge of the leather and inserted into the next hole:



Double cross-stitch.



Starting the buttonhole stitch.

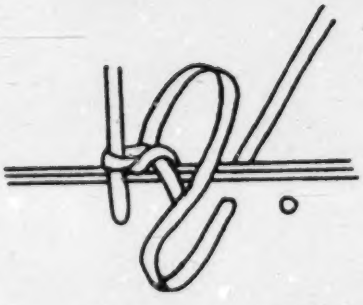


Second step in the buttonhole stitch.

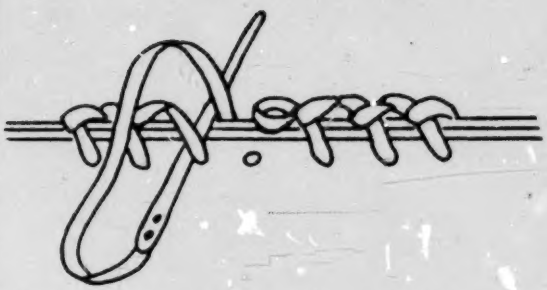
THE BUTTONHOLE STITCH--is a more complicated lacing method that forms its own edge to completely cover the pieces of leather where they are joined. It's started by lacing a needle, bringing it through the first hole and leaving a three inch piece of lace sticking up. The laced needle is then brought from the back and the lace is wrapped once around the three inch piece:

The needle is then put into the second hole and through the stitch made just above the second hole:

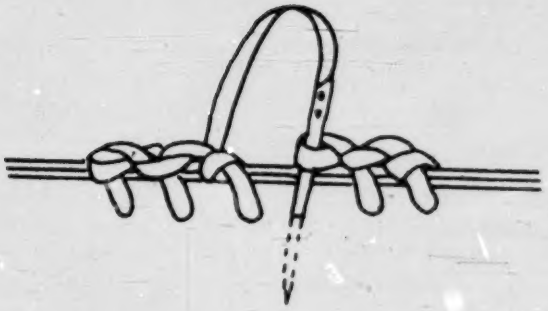
Then it is tightened:



Tightening the buttonhole stitch.



First stitch undone leaving a loop.



Ending the buttonhole stitch.

Lacing a corner with the buttonhole stitch.

INDUSTRIOLOGY PROGRAM

Grade: _____ Date: _____

Lesson no: 700

Title of Lesson LEATHER IN INDUSTRY

Goals:

1. Familiarize the students with leather in its relation to industry.

2. Familarize the students with the uses of leather and the occupations related to those uses.

Objectives:

1. Each student will list 5 major uses of leather and the occupations related to those uses.

2. Each student will express orally his understanding of the leather industry.

Student Activities:

1. Group discussion of job opportunities in the leather industry.

   Discussion Points:
   1. Job Availability
   2. Security
   3. Pay
   4. Working conditions

2. Discussion on the pro's and con's of imported leather goods and its effect on our economy, the emphasis to be placed on the diminishing show industry in the United States.

Assignment:

Have the students bring to class 2 or 3 examples of leather products.

Teacher Preparation (film guides, worksheets, Field trips, Speakers, etc.)

1. Possible field trip to a leather industry.
2. Tape and slide presentation of a visit to a tannery.
3. Handout on leather products and related job opportunities.

Supplies and Resources Needed

Consumable Non-Consumable

INDUSTRIOLOGY PROGRAM

TOOLING AND CARVING

Goal:
1. Develop an understanding of tooling and carving.
2. To be able to properly demonstrate an ability to use carving and stamping tools safely.

Objectives:
1. Each student will describe the various operations of the carving and stampling tools previously mentioned and used during classroom discussion.
2. Each student will perform a given number of operations as indicated on a handout sheet.

Student Activities:
1. Discuss the operations of each tool described.
2. Discussion of name and safe use of each tool.

Teacher Preparation:
1. Develop a handout sheet to evaluate performance objectives.
2. Develop a handout of carving and stamping tools and their operations.
3. Prepare a demonstration on the various operations in tooling.

Resources Needed: (Optional)

Tandy Leathercraft Magazines
Making It in Leather, Hayes, Vincent, H.
Working with Leather, Parker, Xenia Ley
Leathercraft, Zimmerman, Fred W.

Supplies Needed:

Assortment of Tooling and Carving Tools
Patterns or Templates
Sponges and Bowls (Plastic)
4' x 4" wood work blocks with hold downs (tacks)
Leather swatches

Assignment:

The student will, using a template, pattern or his own design, tool a leather project.

INDUSTRIOLOGY PROGRAM

FINISHING

Goals:
1. Develop an understanding of the finishing of leather
2. Develop a safe and practical knowledge of the steps involved in finishing a leather project.

Objectives:
1. Each student will describe the various methods and materials used in the finishing of leather.
2. Each student will be able to properly finish a leather project using at least one method described

Student Activities:
1. The student will, using the methods described, treat, dye, lacquer, etc., his project or similar item.
2. The student will discuss and explain the various methods employed in the finishing of leather.

Assignment: Have the students prepare a poster showing the effects of different finishes on leather. (Group project)

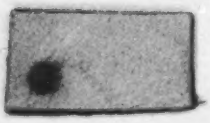
Teacher preparation:
1. Develop samples of leather using different colored dyes, paints, stains and finishes, etc.

2. Develop a worksheet of all the processes of finishing with the advantages and disadvantages of each.

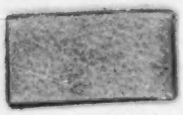
Supplies Needed:
Leather
Dyes (Different colors)
Paints (Acrylic, oil)
Stain
Felt tip pens
Lacquer
Leather cleaner
Saddle soap
Sheeps wool applicators
Leather Wax

INDUSTRIOLOGY PROGRAM

FINISHING TECHNIQUES



NATURAL



NATURAL
(with saddle soap)

DYED

DYED
(buffed with saddle soap)

DYED
(lacquered)

INDUSTRIOLOGY - LEATHERCRAFT

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